

The Iron Age

A Review of the Hardware and Metal Trades.

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Transmission of Mechanical Power by Compressed Air.

Professor Barnard, in his report of the Paris Universal Exposition, truly observes that next in importance to the creation of a new motive power, may be placed any material improvement in the methods of making available the powers which we have. Nature often furnishes us with such powers in abundance in situations where they cannot be conveniently converted to use. The positions of waterfalls are determined by geographical accidents. These do not always concur with the causes which promote the growth of towns and development of industries. If it were possible to transfer the immense forces which are thus unprofitably expending themselves, to points where there are hands to direct them, and material on which to employ them, they might be productive of incalculable wealth, and of immeasurable benefit to mankind.

The foregoing views, so clearly expressed, are eminently correct; but there is another power running to waste, which the engineer, ere long, will be called upon to utilize, viz., the power of the tides. Already a prominent association has been formed in France for erecting tidal motors, on a very large scale. Thus, while engineering skill has nearly exhausted itself in endeavors to improve the steam engine, a new field opens, boundless in extent, which will demand far greater abilities than those called for within the narrow bounds hitherto limiting the energies of the mechanical engineer. The grand scheme of utilizing the natural forces now running to waste, divides itself into two distinct branches. 1st. The requisite mechanism for receiving the force exerted by nature. 2d. The means for transmitting that force to desirable localities. It is the latter branch which we propose to discuss on this occasion. But, before entering on the subject, it will be proper to point out that it is not the natural forces alone which the engineer is called upon to devise means for transmitting. Indeed, with our present abundant supply of coal, the transmission of force developed by steam will be most frequently called for, since, however portable in its character, the steam engine cannot be applied in all places where power is required. The experience of late years has shown that the substitution of mechanical power for manual labor in driving tunnels, and for mining operations, has reduced the cost and greatly increased the amount of work done in a given time. But the presence of steam in tunnels and in the galleries of mines is wholly inadmissible; hence, small motive engines, operated by compressed air, have been introduced for operating the rock drills and other cutting tools. Not only has the work by these means been greatly accelerated, but the escape of the exhaust air from the motors has, in a material degree, tended to purify the atmosphere within the mines, rendering the work healthful which formerly proved so destructive to the miners.

The first question which presents itself in treating of the transmission of force by compressed air, is the size of the tube necessary to convey a certain amount of energy in a given time—*pressure and velocity* being the elements which determine the question. Fortunately, we are not without practical data on the subject, the engineers of the Mont Cenis tunnel having, some time ago, thoroughly investigated it. The result of their labors has been recorded in the Report of the United States Commissioners at the Paris Universal Exposition of 1867. The Commissioners state that, at the date of the report on the progress of the work in the tunnel during the year 1863, the operation was carried on at a distance of more than six thousand feet from the reservoirs of compressed air, and that nine borers were in operation with a force of two and a half horses power each. The tube conveying the air was very nearly eight inches in diameter, the air being under a pressure of six atmospheres, and its velocity in the tube three feet per second. The transmission of the power under these very favorable conditions was attended with no sensible loss, the pressure not being perceptibly less at the working extremity of the tube when all the perforations were in operation than when the machinery was entirely at rest.

The report of the commissioners furnishes a very full account of the result of the experiments conducted at Corsica, in 1857, by order of the Italian government, on the resistance of tubes to the flow of air through them. These experiments were made previously to the commencement of the work on the tunnel, the employment of compressed atmospheric air as a motive power to actuate the boring apparatus, being at the time considered a doubtful expedient. The report states that it was the aim of the investigation, not only to ascertain the absolute loss of force attending the transmission of air through tubes of certain dimensions at certain velocities, but also to determine what are the laws which govern the resistance when the velocities of the air and the diameter of the tube are varied. The following conclu-

sions were deduced from the experiments: 1. The resistance is directly as the length of the tube. 2. It is directly as the square of the velocity of flow. 3. It is inversely as the diameter of the tube.

The fact before adverted to, that in the actual working of the machines in the tunnel at Bardonche, no perceptible loss of power was experienced at a distance of fully six thousand feet from the reservoirs, must be attributed to the want of delicacy of the manometer of pressure gauge employed. Although insignificant at moderate distances and low velocities, the

recommend our engineering friends who may be called upon to transmit mechanical power by compressed air, not to aim at economy by employing tubes of very small diameter.

Having thus disposed of the first branch of the subject under consideration, let us now consider the mechanism needed to compress the air to be transmitted. At first sight the solution of the problem appears to be very simple, but due reflection at once suggests to the practical mind numerous difficulties. Considerations of weight, space, and first cost, of course, demand the adoption of a

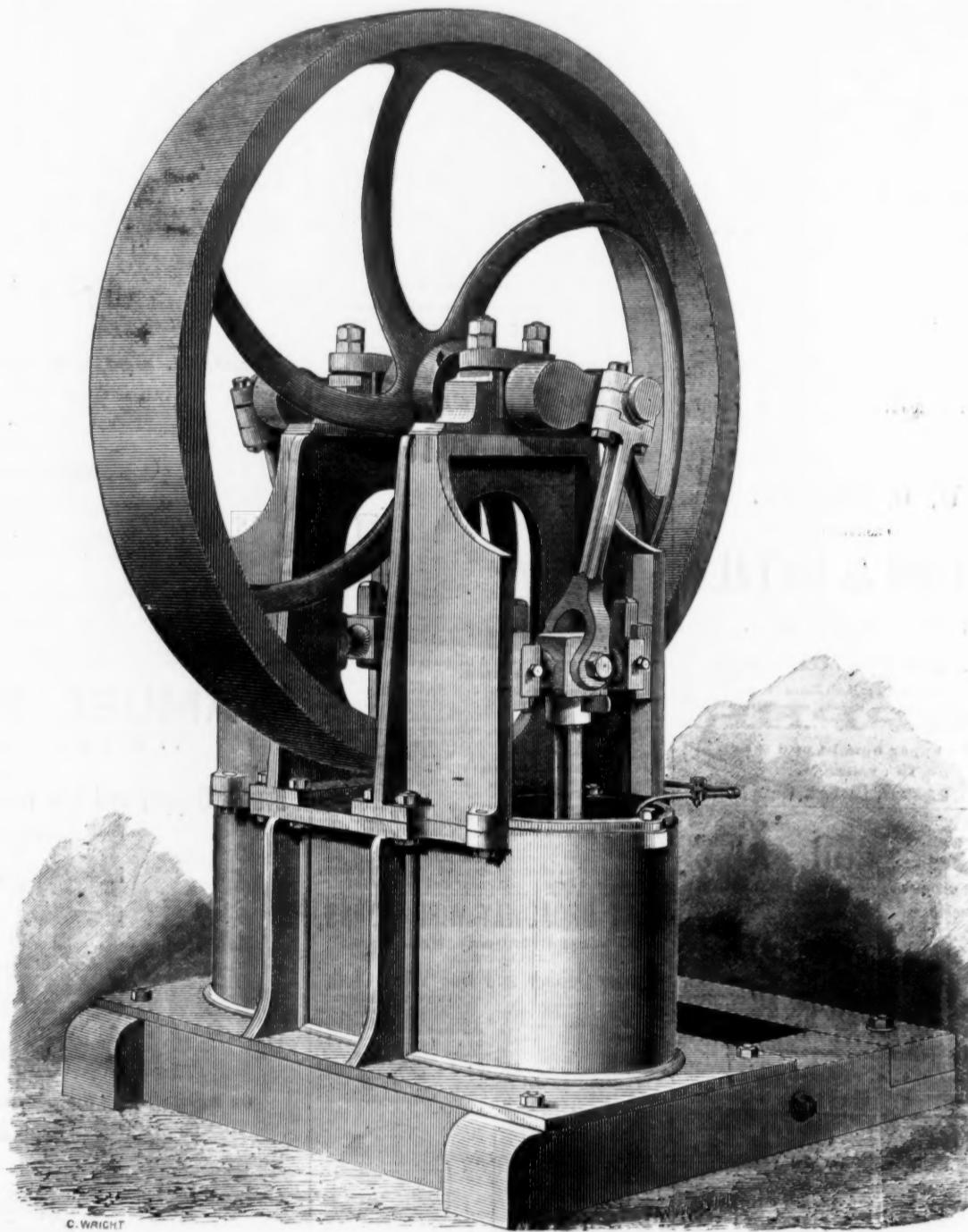
compressing piston before entering the cistern. A glance at the sectional drawing will give a clear idea of the nature of the device and the mode of operation, which may be thus briefly described: A small pipe, communicating with a reservoir or other supply of water, is applied behind the machine, provided with a branch for each compressing cylinder. These branch pipes are bent downward vertically in such a manner that a stream of water flowing through each will fall on the top of the compressing piston, near its circumference. The compressing cylinders are suspended within a water cistern, sup-

on inspection, is very short compared with the length of throw of the crank; hence, the piston will remain for a considerable interval of time, near the top of the cylinder, during which time the necessary discharge of the water lodged on the top of the piston takes place. To prevent undue accumulation of water in the cistern, an overflow pipe is introduced at the side, as shown in the illustration. It should be particularly noticed that the air, while undergoing compression in the cylinder, is completely surrounded by metallic surfaces cooled by the circulating water. But this is not all. During the reciprocating action of the piston, the body of water lodged on its top washes the inside of the cylinder both during the upward and downward movement. Now, the speed of the piston is fully one hundred and fifty feet per minute, hence, an internal refrigeration is established, far more efficient than the external circulation, however rapid. The metal composing the cylinder of Captain Ericsson's air compressor, it will thus be seen, is actually cooled on both sides, a very remarkable and almost paradoxical achievement. Again, it will be perceived that the circulating cold water continually washes the top of the piston before entering the cistern. Accordingly, the entire quantity of water required for cooling during the compression passes over the piston at the initial low temperature, thereby subjecting the part of the machine that most needs cooling to the greatest amount of refrigeration. As regards lubrication, it is self-evident that no conceivable plan can be more efficient than that of actually washing the inside of the cylinder with the lubricating medium, both during the up and down movement of the piston.

Regarding the utility of cooling the compressed air, it needs no demonstration to show that refrigeration after the air has left the compressing cylinder, recommended by some engineers, is not only useless, but tends to reduce the efficiency of the compressed air as a motive agent. Obviously, if the air during its transmission from the compressor to the motor intended to be actuated, loses in temperature, it also loses in bulk. On the other hand, refrigeration within the cylinder during the down stroke is useful, as it tends to check the swelling of the volume of air under the piston, caused by the heat generated by compression, consequently diminishing the necessary motive power. In the machine under consideration, as we have seen, this useful refrigeration within the cylinder during the compression, is rendered thoroughly efficient by the means described.—*American Artisan* for March.

The Usk Bridge.

The superstructure of the bridge lately built across the river Usk consists of four spans of lattice girders, each 80 ft. 9 in. long. The girders are 20 ft. 6 in. apart from center to center, and the bridge has a clear width of 25 ft. 6 in. The girders are continuous over the whole length, and are 9 ft. 9 in. in depth, with flanges 2 ft. wide. They are composed of plates, angle and T-irons, and the flanges have a sectional area of 62 square inches at the center of span. The struts, which occur every 4 ft. 9 in. on both sides of the web, are each composed of T-irons connected by an intervening $\frac{1}{4}$ in. gusset plate. To the top and bottom of these struts, and to the webs of the girders are connected the diagonal tie bars, which have varying sections, lessening toward the center of the girder. The cross girders are formed of plates and angle irons 2 ft. 4 in. deep, resting on and fastened to the bottom flange of the main girder at every alternate strut. On the top of the cross girders four small longitudinal girders run throughout the whole length of the bridge. The rail sleepers are carried by four longitudinal rail bearers. The girders form a trough, in which the ballast for the permanent way is laid; the whole bridge is covered over with wrought iron 5-16 in. roadway plates. The piers consist of cast iron cylinders 8 ft. in diameter at the bottom, filled partly with brickwork and cement, and partly with cement concrete, the load of the superstructure coming upon the filling thus formed. At about low water level there is a conical diminishing piece reducing the 8 ft. diameter to 4 ft. 6 in. A substantial bearing on the solid column below is obtained by a flange, or disc. The columns are continued with this diameter to about 6 ft. above high water level, and then terminate with caps which receive the ends of the girders. All the cylinders of the piers have internal flanges faced in the lathe. These columns are placed in pairs 28 ft. 13 $\frac{1}{2}$ in. apart from center to center, and are strongly connected to each other by wrought iron bracings consisting of three heavy plate girders and tie bars, the whole being secured by bolts to the cylinders. The abutments are of stone, and to obtain a firm foundation on the left bank a very deep coffer-dam was necessary. On the other side, the rock being generally exposed at low water, it was simply leveled off, and the abutment raised at short intervals between tides until high enough to admit of its being built up continuously.



CAPT. ERICSSON'S AIR COMPRESSOR—Fig. 1. [For Fig. 2 see page 5.]

experiments proved that the loss becomes serious when the velocity and distance are considerably increased, since agreeable to the law before cited, the resistance varies as the square of the velocity. Consequently, when the velocity is six times greater than the low rate before referred to, or thirty-six feet per second, the resistance will be thirty-six times greater—the power developed increasing in the ratio of the volume of air delivered, viz., six times. It will be perceived, therefore, that while the length and diameter of a tube remain unaltered, and while the absolute resistance opposed to the flow of a current of air through it varies as the square of the velocity, the relative resistance is only as the simple velocity. It follows from the foregoing facts, that the power of compressed air varies as the product of its pressure and its volume; hence, when the pressure is constant, as the volume simply. But the volume delivered varies as the velocity multiplied by the square of the diameter of the tube. Now, as the resistance is inversely as the diameter, and the volume directly as the square of the diameter when the velocity remains constant, it follows also that under a given pressure and velocity the relative resistance (namely, the resistance divided by the power), will vary inversely as the cube of the diameter. Obviously, therefore, by enlarging the diameter of the tube, we may increase the power transmitted, and at the same time diminish both the absolute and relative resistance. In conclusion, we strongly

recommend our engineering friends who may be called upon to transmit mechanical power by compressed air, not to aim at economy by employing tubes of very small diameter.

Having thus disposed of the first branch of the subject under consideration, let us now consider the mechanism needed to compress the air to be transmitted. At first sight the solution of the problem appears to be very simple, but due reflection at once suggests to the practical mind numerous difficulties. Considerations of weight, space, and first cost, of course, demand the adoption of a double-acting compressing cylinder; hence, the practicability of employing double-action is the very first question that presents itself. Now, in double-acting cylinders both ends must be closed, consequently lubrication of the compressing piston must be effected from without. Supposing that means for effecting such lubrication have been devised (by no means easy), will the packing of the piston be preserved and abrasion prevented? In answering this question we must bear in mind that at even a moderate pressure the compression of the air generates a degree of heat which precludes the employment of oil, as it quickly dries up and ultimately burns. Water, if continually replenished, so as to make good the loss caused by the formation of steam, may answer for a short time. The dust drawn into the cylinder from the surrounding atmosphere, will, however, mix with the water and soon form a paste, resembling mud, on the top of the piston, productive of friction and abrasion of the cylinder incompatible with the functions of the piston.

The accompanying illustrations represent a perspective view and longitudinal section of a machine constructed by Captain Ericsson for the purpose of compressing air, in which the difficulties before referred to have been effectively overcome; the leading feature being, that the compressing cylinders, open at the top, are immersed in a cistern of water through which a continuous circulation is kept up by a current of water which flows over the

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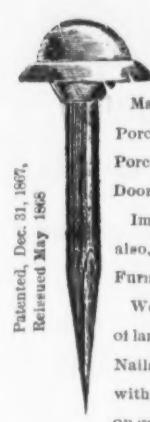
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The Wrought Iron of the Henderson Process for the Manufacture of Steel and Homogeneous Wrought Iron.

In our impression of the 29th ult. we noticed the Henderson process for the production of wrought iron, and gave comparative tests of the iron of this process with tests of puddled iron. We also gave tests of homogeneous wrought iron made by melting the muck bars of this process (from Chillington pig) in crucibles for comparison with the tests of wrought iron. We now wish to call attention to its advantages for the manufacture of steel and homogeneous wrought iron, by giving tests of the steel and homogeneous wrought iron made from the wrought iron of this process and tests of the steel and homogeneous iron of the most celebrated manufacturers, made from the purest ores in Sweden smelted with charcoal. The best qualities of English and German cast steel are made from Swedish iron, which is very costly. In this connection it will not be out of place to report the tests of the homogeneous wrought iron from them published for comparison with similar kinds of metal made in Sweden from the purest ores smelted with charcoal. With this view we give tests for comparison of the homogeneous wrought iron, or mild steel, made by Mr. Christian Aspelin, of the Fagersta Works, Sweden, the tests of which were made by Mr. Kirkaldy.

Aspelin's, made for Paris Exhibition of 1867, which took the first premium:

Average breaking weight per square inch of original area..... 61,312 lbs.
Contraction of area at fracture..... 60 per cent.
Average breaking weight per square inch of fractured area..... 159,000 lbs.
Elongation..... 16.5 percent.

Aspelin's, made for Vienna Exhibition of 1873: Hammered bars, 1 in. square, turned to 0.619 inch diameter:

Breaking weight per square inch of original area..... 65,220 lbs.
Contraction of area at fracture..... 64.3 percent.
Breaking weight per square inch of fractured area..... 180,000 lbs.
Elongation..... 15.4 percent.

Henderson's homogeneous wrought iron, from "muck" bars made from Chillington Staffordsire pig iron, which contained 1% phosphorus— $\frac{1}{2}$ in. octagon, as hammered:

Breaking weight per square inch of original area..... 63,870 lbs.

Contraction of area at fracture..... 66 per cent.

Breaking weight per square inch of fractured area..... 187,847 lbs.

Elongation..... 24.4 percent.

The difference in favor of Henderson's, as compared with Aspelin's, of 1867, is as follows:

Breaking weight of fractured area..... 31.1 percent.
Elongation..... 47.8 "

As compared with Aspelin's of 1873:

Breaking weight of fractured area..... 43.9 percent.
Elongation..... 58.4 "

A comparison of the following tests shows interesting results. Jowett's cast steel for chisels, tested by Mr. Kirkaldy, were:

Average breaking weight per square inch of original area..... 124,852 lbs.
Contraction of area at fracture..... 17.9 percent.
Average breaking weight per square inch of fractured area..... 130,253 lbs.
Elongation..... 7.1 percent.

Krupp's cast steel for chisels from best Swedish iron, tested by a committee of engineers at Woolwich Arsenal, were as follows:

Average breaking weight per square inch of original area..... 111,160 lbs.
Contraction of area at fracture..... 5.7 percent.
Average breaking weight per square inch of fractured area..... 128,343 lbs.
Elongation..... 5.2 percent.

The analysis of Krupp's cast steel by Dr. Odling is:

Carbon..... 0.98 per cent.
Silicon..... 0.18 " "
Magnesia..... 0.41 "
Phosphorus..... none "
Sulphur..... 0.01 "

The cast steel from iron of this process from Yorkshire pig iron, tested by Mr. Kirkaldy, is as follows:

Average breaking weight per square inch of original area..... 119,130 lbs.
Contraction of area at fracture..... 26.2 percent.
Average breaking weight per square inch of fractured area..... 161,601 lbs.
Elongation..... 8.8 percent.

The Yorkshire pig iron contained 0.62 percent of phosphorus, the bar iron was chemically pure, and the steel contains 0.84 per cent. of carbon.

Krupp's soft cast steel for bolts, tested by Mr. Kirkaldy, is compared with the soft cast steel of this process, also tested by Mr. Kirkaldy.

Krupp's steel:

Average breaking weight per square inch of original area..... 92,015 lbs.
Contraction of area at fracture..... 34.0 percent.
Average breaking weight per square inch of fractured area..... 139,431 lbs.
Elongation..... 15.3 percent.

Soft cast steel from iron of this process from Yorkshire pig:

Average breaking weight per square inch of original area..... 97,435 lbs.
Contraction of area at fracture..... 34.0 percent.
Average breaking weight per square inch of fractured area..... 143,819 lbs.
Elongation..... 14.4 percent.

Chisel cast steel from wrought iron from "level" hot blast Staffordshire pig iron by this process, tested by Mr. Kirkaldy, is as follows:

Average breaking weight per square inch of original area..... 112,915 lbs.
Contraction of area at fracture..... 10.2 percent.
Average breaking weight per square inch of fractured area..... 126,898 lbs.
Elongation..... 8.4 percent.

The level pig iron contained 0.72 per cent. of phosphorus, the cast steel was pure iron with 0.9 per cent. of carbon.

Tests of chisel cast steel made from best Swedish iron by different authorities are given below for comparison. The breaking weight per square inch of original area are given:

Krupp's, English arsenal tests..... 108,160 lbs.
Krupp's No. 1, Prussian arsenal tests..... 117,313 "

J. Brown & Co., Sir Wm. Fairbairn's tests..... 116,183 "

Chas. Cammell & Co., Sir Wm. Fairbairn's tests..... 130,908 "

Naylor & Vickers, Sir Wm. Fairbairn's tests..... 118,015 "

The average being..... 128,015 "

The steel from the wrought iron of this process is softer than that made from Swedish iron, and will take a higher carbonization, which will increase its tensile strength on the original area. This is shown by the strength on the square inch of fractured area being greater than the other kinds given here for comparison,

of which Krupp's may be considered the fair average.

The steel made from the iron of this process was the result of trials made to ascertain which of the reagents available for use in this process would produce the purest iron and consequently the best steel, and being all the results had from these three kinds of pig iron, indicate what may be expected from treating similar kinds of pig iron by this process, although better results may be hoped for when more experience is had.

Robinson's Rail System of Electric Signaling.

In our issue of January 6th we published an interesting description of the system of electric railway signaling, invented by Mr. Wm. Robinson. Shortly after we were desired by Mr. Frank L. Pope to publish a letter, which appeared in our issue of January 29th, claiming credit of the discovery of the principle which is the basis of Mr. Robinson's system. We are now desirous to publish Mr. Robinson's reply to Mr. Pope, which we give below. We shall publish no more letters on the subject:

To the Editor of *The Iron Age*: In your issue of January 29th a letter appears over the signature of Frank L. Pope, on electric railway signaling, which, by stating too little, falsifies truth, belies science, and is generally calculated to deceive your readers, scientific and general.

Let me premise by stating that the article in my issue of January 6, describing my system of rail signaling was true in every particular, and not calculated in the slightest degree to convey a wrong impression as to the origin of rail signaling or as to my other matter.

Nevertheless, Mr. Pope seems greatly exercised lest credit shall be given to me, which he appears to claim, and to which neither of us is entitled, that of originating the idea of using the rails of the track as electric conductors for signaling purposes. This was old twenty years ago.

It now remains to notice some of the errors in Mr. Pope's statements. In connection with the signal used in the Broadway tunnel, which, as is well known, is only a few rods long, he says: "I connected the battery to the rails in such a manner that the wheels of the car would complete the circuit and operate an electric bell during its passage over a certain section of the track." It is rather unfortunate that Mr. Pope should make any allusion to this apparatus to support his claim to rail signaling. I made a personal examination of the signal device in the tunnel, and my distinct recollection of it is that fine wires were used, terminating in small spring plates, over which the wheel passed, connecting the wires by depressing the plate. The rails did not enter into circuit at all, and the device, in various forms, is at least a dozen years old.

Again, Mr. Pope "found, by calculation"—it would be interesting to know by what mathematical process he "found" so much—that it ought to be practicable to convey an electric current through a line of fish-jointed rails for at least two or three miles, even in wet weather." He "tested this idea in 1870, for a distance of between one and two miles, and proved, by actual experiment, that a strong current could be conveyed, at least, that distance, and a magnet operated without serious difficulty." It would also be interesting to know the details of this experiment, the principle of its operation, and why we do not find the successful method of applying that principle in Pope's patent, for which application was subsequently made. Again, in his application for this patent, he "proposed to use the rails in sections of a mile or more in length," and, by November, he had "made a successful experiment on a New England railroad." He continues: "In this experiment I employed the rail circuit," &c. Here, it is evident, Mr. Pope wishes it to be understood that he used a section of rails, say, "a mile or more in length." Such was not the case, however. His own description of this experiment, in a paper read by him before the New York Society of Practical Engineers, and subsequently published, proves that he did not use the "rail circuit" at all in any proper sense of the term. On the contrary, he used fine wires, terminating in short sections of rails—if I mistake not, only one or two rails in length. The train passing over the short rail section at one point closed the circuit through the fine wires, thus exposing the signal, which was held in place by a "detent." The train having reached a distant point, passed over another short section of rails, closing circuit through another magnet, which released the detent and reversed the signal. Since that time Mr. Pope has made mechanical alterations in his signal, but in those in which he has put up, and which I have seen, he still adheres to the fine wires, and short sections of rails as circuit closers. This is the "Bull-Pipe" wire system above referred to. I know Mr. Pope will deny, as he has already done, that he uses substantially Bull's circuits. Those interested, however, are referred to Bull's patent for evidence. There is no case on record wherein Mr. Pope has ever worked a signal in wet weather through a one mile section, or even a half mile section of rails on the principle of operation described in his patent of July 16, 1872, to which he alludes, and, for the benefit of science, I will give him \$500, to pay his expenses if he will accomplish this interesting feat to the satisfaction of a committee of disinterested persons unacquainted with either of us. It cannot possibly be done, as I have repeatedly proven by actual experiment. Furthermore, the best possible corroborative evidence of this is the fact that Mr. Pope uses the "Bull-Pipe" wire system instead of the Bull rail system above described. The latter is a scientific absurdity of the most glaring nature, and none should be deceived by the fact that it was patented by Mr. Pope.

Again, he seems anxious to fix the date on which I began to consider rail signaling, and to this end quotes from an article published in the *American Artisan* to prove that I had not considered it prior to September, 1871. That quotation proves nothing, as, if writing it today, it is doubtful if I would modify it in any particular. I have myself closed circuit and exposed a signal by simply bringing the line wire in contact with a wet railroad tie. To prevent this with an ordinary magnet on open circuit, a high magnetic adjustment is necessary. He also states that, as late as November, 1871, I was still perfecting my wire system. This again proves nothing, for he might have added, also, that it was not until July, 1873, that the last of my wire signals was removed to give place to the rail system. As a matter of fact, however, long before the time that Mr. Pope filed his application for a patent, I held frequent conversations with my brother on the subject of using the rails as conductors. The method subsequently patented by Pope was canvassed and dropped as too "wildly absurd," as Pope puts it, for serious consideration, as nothing operating on the principle of opening and closing the circuit could be applied in using rail circuits properly so called. As early as March, 1870, I had occasion, in the course of my experiments, to employ the principle of short circuiting. I finally arrived at the conclusion, after many months of patient study of the

subject, that from this principle alone, if any, results might be expected in using rail circuits, and my system, operating on this principle, is, in actual working, proving successful far beyond my most sanguine expectations.

Nevertheless, as regards Mr. Pope's system, find my own, the question of priority of invention is of no possible consequence, as the two systems operate on different and distinct principles, his on the principle of opening and closing the circuit, mine on the principle of short circuiting the current—the circuit never being opened—as clearly described

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PHILADELPHIA CORRESPONDENCE.

PHILADELPHIA, Feb. 16, 1874.

For the whole of the week past this city has been in a tumult of partisan politics, with scarcely a thought devoted to anything else. To judge from the violent personal abuse, recriminations and "last cards," in the columns of the secular press, one would suppose that the candidates for popular suffrage would rather lead a forlorn hope, storm a battery, or engage in an Indian war than submit their reputations, their private affairs, and the habits and peculiarities of the members of their families, male and female, to the tender mercies of the average editor. What constitutes fitness for the Centennial Mayor of a city like Philadelphia may be uncertain, but one paper claims superior respectability for its candidate because, before becoming a politician, he made fine candy; while his opponent had advanced no higher in the struggle for life than to edit a newspaper—a queer scale by which to graduate the abilities of candidates for office. Fortunately, the election will be over before this appears, and barring contest of the result, we shall breathe freely again. Whichever party wins, there is no prospect of any needed reform, or of more economical administration; this will be postponed until the great moral earthquake, which surely impending over this country, and which will wipe out all existing political organizations, shall occur.

In manufacturing circles things are moving slowly, but perhaps more surely, than if forced. Labor is quiet, with the exception of some few strikes among weavers, a class which is generally disturbed. There are a few wrinkles, however, on the surface which deserve notice. One of these is a project to circumvent the chain makers by the introduction of a practical chain making machine. Now, chain making machines are not new; several are in existence, if not in operation, but a practical machine

pity of the welding hammer obviating the difficulty of thin scars in hand welding. The machinery is not experimental, but has been thoroughly tried, and the inventor is a practical, clear headed individual, who, to a liberal education and much natural ability, has joined a thorough shop knowledge of machinery, and is in that felicitous condition rarely vouchsafed to inventors—peculiarly easy—having attained a competence from his machinery business. With a laudable ambition, he proposes not only to engage in the manufacture of all sizes of chain for the American market, including those sizes hitherto entirely imported, but to export chains of his own manufacture to England, and undersell John Bull on his own soil. September, 1874, is the date at which he proposes to have American chain in the English market, and to submit it to any test of strength which the same diameter of iron will resist in any other form. In this patriotic commercial ambition the readers of *The Iron Age* will heartily join, and as the enterprise progresses, the machinery for a large works now being built, it

tion of this grade of true steel, always in demand and always likely to be, which cannot be overlooked.

While writing of steel, I must note the frightful accident at the Johnstown Bessemer Works during the week. Here the casting ladle, filled with molten metal from a converter, just ready to be run into the ingot molds, was cap-sized by the breaking of the jib of the crane suspending it, and the contents distributed over the men engaged at work. Of course they were all, more or less, seriously burned and some fatally. One man nearest to the falling ladle tripped, and fell in his effort to escape, thereby saving his life, the stream of molten steel passing just over his head, the heat singeing his hair. That man may console himself with the philosophical Frenchman, that "he is reserved for something worse."

Two iron vessels have been launched here this week—one, the *Harrisburg*, an iron steam collier of 1500 tons, for the Reading Railroad Co., Cramp's yard, and the other, the *Dahlia*, a large tug for light house duty in the revenue

service, filled to the satisfaction of their employers.

Report of the Trustees of the Wood Estate.

The trustees of the estate of James T. and Charles A. Wood make the following report of transactions to February 5, 1874, made in settlement of the estate: The receipts from sales of individual property have been as follows:

Real estate, mortgages, etc.	\$167,565 14
Stocks	4,338 38
Rents	213 00
	\$172,316 52

Paid Mrs. H. Wood, individual claim	\$149,628 00
Taxes	734 44
Insurance	142 50
Expenses	517 80
Mortgage, E. R. Sterling	3,240 00 145,263 34
	\$27,053 90

Amount of cash received from firms of James Wood, Sons & Co. and James Wood & Co.	\$ 3,478 66
Amount of Ledger Accounts collected	24,032 91
Amount of cash received for sales of merchandise at Wheatland Mills	34,572 69
Amount of cash received for sales of merchandise at Eagle Mills	28,156 91
Amount of cash received from rents	881 25
Amount of cash received from sale of stocks	805 64
Amount of cash received from sale of property, mortgages, etc.	21,408 34
	\$131,779 49

Paid laborers, watchmen, etc.	\$16,972 20
Insurance and taxes	11,351 54
Prefixed claims for labor	19,316 86
Expenses	7,512 81
Collateral note, security, stock in Shenango and Wheatland coal companies, to the amount of \$125,000 (Schedule of Assets A, page 1), and interest due Mrs. H. Wood	33,712 25
Collateral note, security stock in Shenango and Wheatland coal companies, to the amount of \$112,500 (Schedule of Assets A, page 3), and interest due Trustees under the will of James Wood, deceased	27,606 61
	\$116,472 27

Amount cash remaining on hand	\$ 18,307 22
Our total receipts of cash to date have been	\$280,042 93

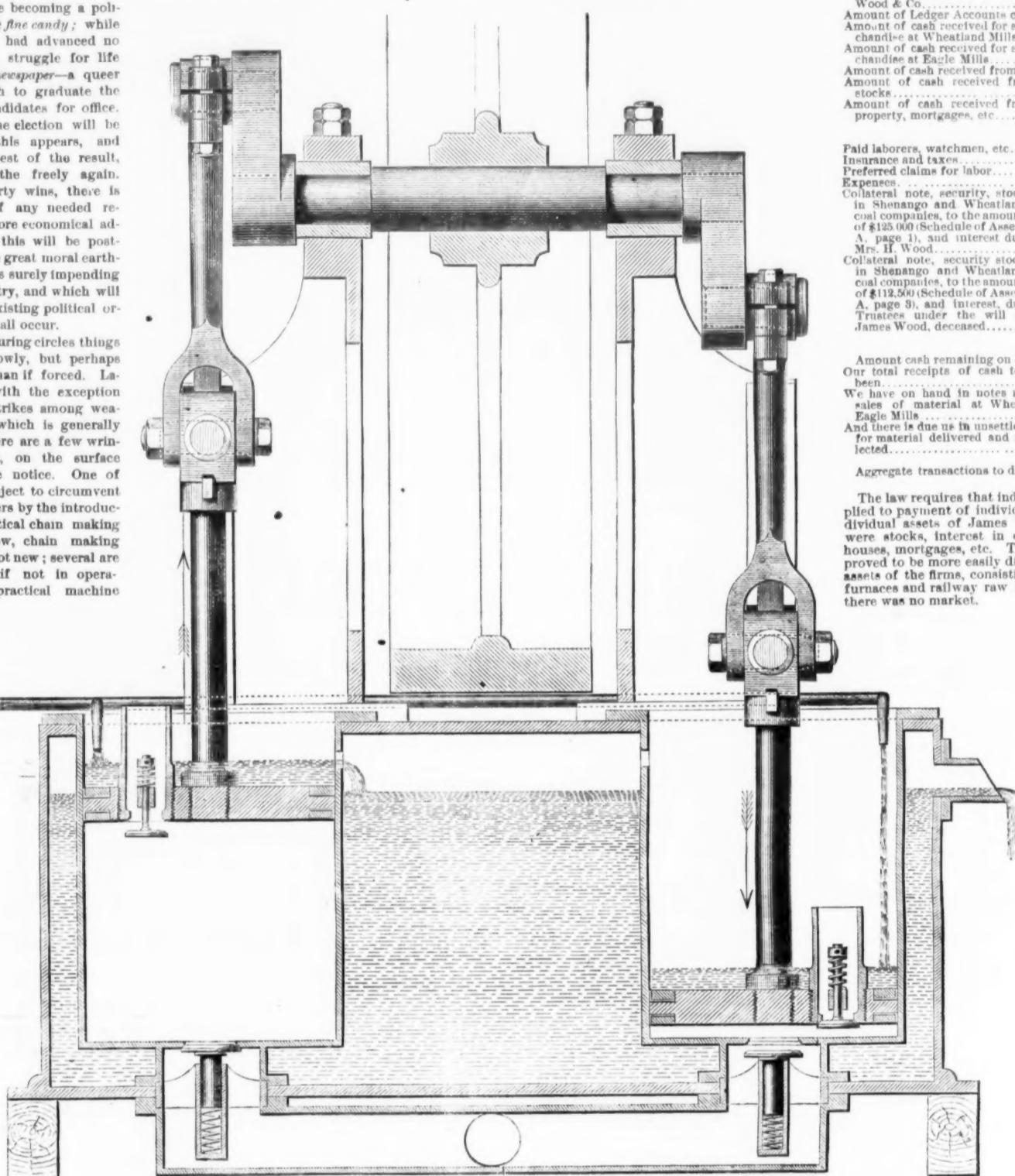
We have on hand in notes received for sales of material at Wheatland and Eagle Mills

And there is due us in unsettled accounts for material delivered and not yet collected

25,030 00

Aggregate transactions to date \$404,086 34

The law requires that individual assets be applied to payment of individual debts. The individual assets of James T. and C. A. Wood were stocks, interest in coal farm, dwelling houses, mortgages, etc. This class of property proved to be more easily disposed of than the assets of the firms, consisting mainly of mills, furnaces and railway raw material, for which there was no market.



CAPT. ERICSSON'S AIR COMPRESSOR—Fig. 2. [For Fig. 1 see page 1.]

which should bend the iron, mechanically form the link, flatten the scars for the weld, and finally close the weld, making a stronger, because more thoroughly proportioned, weld than can be made by hand, is new. Such is the machinery now being constructed on a large scale, and shortly to be put in operation. I am not at liberty to give the precise locality or the names of the inventors and manufacturers engaged in this operation, but know both, and am satisfied the thing will be carried out fully. The process is conducted on two machines, one of which receives the heated iron bars for any size chain, a separate machine being, of course, provided for each size, bends the link to the proper form, cuts it off at the requisite length, and gives it the peculiar irregular twist known to those who have watched chain makers in their work. Further flattens the ends of the link, thus preparing the scarf for the weld, and deposits the link on a bar, proceeding *du capo*, as before; the whole operation being performed while the hand chain maker is taking the first squat at his link blank. When the bar upon which the links are strung is filled, an empty bar is substituted, and the links transferred to a heating furnace where they receive a welding heat. From this they go to a steam hammer, having a series of unique dies, in which, next to the bending machine, lies the gist of the invention. These dies weld the links perfectly, thoroughly and completely, and, in using these adjectives, I mean precisely what I state. Examine the best made hand chains, particularly of the smaller sizes not made in this country, and it will be seen that on each side of the weld, the link, to use a technical expression, is "robbed" of its iron, that is, the iron is drawn forward and into the scarf of the weld to obviate the difficulty of welding with thin scars. This weakens the body of the link to benefit the weld, and, as a chain is no stronger than its weakest link, it is at this spot that the weakened iron breaks, and not at the weld. The machine welded links being formed in a regularly shaped die have not this objection, but the iron forms a gradual taper, the scars having been thoroughly and exactly prepared by the bending machine, and the force and ra-

will be reported from time to time for their benefit.

Another step of progress in matters germane to the trade we represent is attracting much attention from practical and scientific men, as well as from capital. This is a mechanical arrangement which will appear to have solved the problem of casting large masses of crucible steel, and must necessarily greatly increase and cheapen the production of that article. As is well known, no more expensive method of accomplishing an object is used than the present method of making crucible steel. From the construction of the furnaces, except in the case of the Siemens' furnace, as hereto applied, at least two-thirds of the products of combustion are wasted, while the vessels used for fusion are contracted and of small capacity. By the improvement referred to, further flattens the ends of the link, thus preparing the scarf for the weld, and deposits the link on a bar, proceeding *du capo*, as before; the whole operation being performed while the hand chain maker is taking the first squat at his link blank. When the bar upon which the links are strung is filled, an empty bar is substituted, and the links transferred to a heating furnace where they receive a welding heat. From this they go to a steam hammer, having a series of unique dies, in which, next to the bending machine, lies the gist of the invention. These dies weld the links perfectly, thoroughly and completely, and, in using these adjectives, I mean precisely what I state. Examine the best made hand chains, particularly of the smaller sizes not made in this country, and it will be seen that on each side of the weld, the link, to use a technical expression, is "robbed" of its iron, that is, the iron is drawn forward and into the scarf of the weld to obviate the difficulty of welding with thin scars. This weakens the body of the link to benefit the weld, and, as a chain is no stronger than its weakest link, it is at this spot that the weakened iron breaks, and not at the weld. The machine welded links being formed in a regularly shaped die have not this objection, but the iron forms a gradual taper, the scars having been thoroughly and exactly prepared by the bending machine, and the force and ra-

service of the government. The latter was built at Neafy & Levy's yard.

The Reading R. R. Co. announces the stoppage of coal trains to the Port Richmond yards after the 16th inst. for 20 days, to allow for the work of excavating for the sub-grade crossing of the track at this point. The stock of coal on hand will be sufficient to allow of a full supply to veesels in the interim. I find among the exchanges the following waifs of iron information:

A mortgage has been recorded in the recorder's office of Schuylkill county for \$1,000. It is given by Seyfert, McManus & Co., of Reading, to the American Life Insurance Company, of Philadelphia, to secure a loan.

The Altoona Iron Company's rolling mill is now in full blast, having more orders and making as good, if not better, time than before the panic. Last month they lost only one day through some misjudgment in regard to the operations of the coal mines.

The members of the Ohio Valley Iron Association, representing fourteen manufacturers and rolling mills in Ohio, Tennessee, Indiana, Missouri and Kentucky, met in Louisville on the 10th inst., when the following resolutions were adopted:

Whereas, The condition of the iron market renders it imperative upon the manufacturers represented in this association to compete with Pittsburgh in her prices for labor; and

Whereas, This association does not desire in any respect whatever to do any injustice to any workmen in the employ of any of its members; therefore, it is

Resolved, That those workmen desiring to be retained by any and all members of this association are hereby notified that unless they report to the officers of their respective mills their readiness to go to work on or before the 20th of February, at the Pittsburgh prices, as proposed on the 10th of December, they will be discharged, and a printed list of such workmen so discharged will be furnished the other members of this association, who will not employ them.

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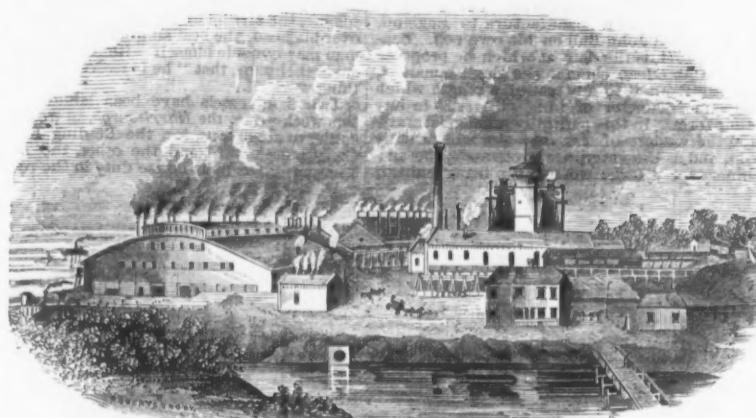
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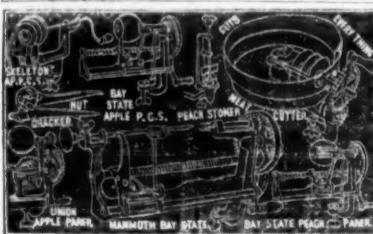
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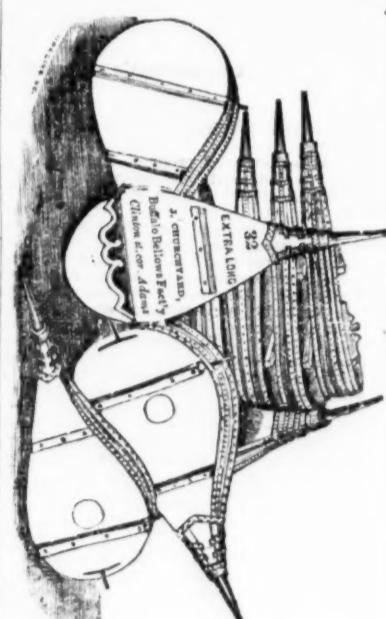
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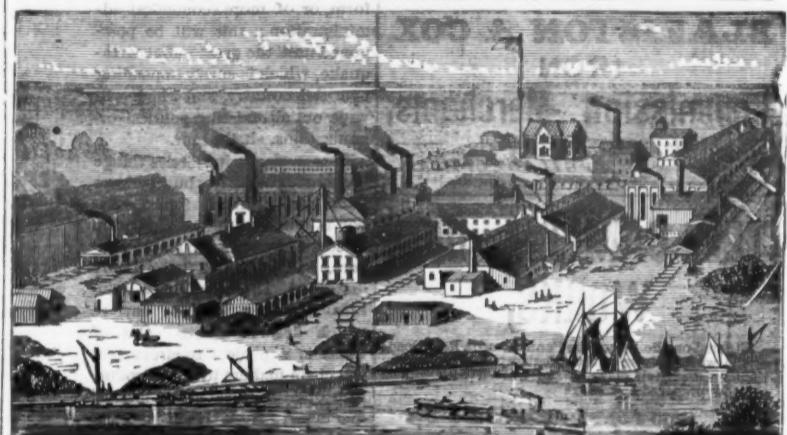
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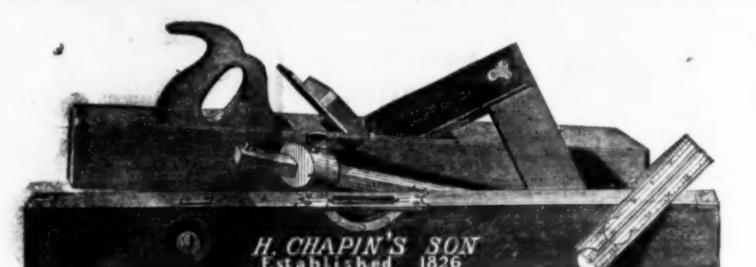
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American Iron, Capital and Railways.

We take the following from an able contemporary, the *North American*, of Philadelphia:

The production of iron by the British mills last year was over six millions of tons. The present capacity of the American mills is over four millions of tons. We can, then, equal two-thirds of the British product if we have the market, and the question is how can we get it? We shall not do so by reducing the tariff continually, since that invites foreign iron more and more. We shall not get it by keeping up a universal croak against the steady extension of the railway system—which has done so much for the advancement of American civilization, and which has afforded, upon the average, a most profitable investment for American capital—since the railway consumption of iron, 1,400,000 tons per annum, is the leading item in the market. But we shall do it by maintaining protective duties on imports, and by restoring confidence to the railway companies, and resuming our general operations for the extension of the system.

In view of the sudden and alarming prostration of industry and trade during the panic and revulsion, we deemed it best to attack boldly the main point, which was the general distrust of the railway securities, because if that continued recuperation was impossible, the connected interests being so vast that a paralysis of railway credit seemed to involve a danger of general bankruptcy. We are happy to say, now that the crisis is past, that railway credit is rapidly recovering, that things look hopeful, and there is quite a good prospect of renewed activity in the spring. The prices of iron have fallen so much as to favor railway construction, while for a considerable time the high prices were very much against it. We are told that the West generally has not been much affected by the panic, but this is probably a Western exaggeration, as the Western railways produced the most failures to pay interest and showed the most serious falling off in business, and the Western hotels scarcely paid expenses. But the railway returns for December evince recovery of tone, apparently inspired by the belief that the four great seaboard cities are again able to help them.

The feverish spirit of speculation exhibited at the stock exchanges of New York and Philadelphia has satisfied thousands that they might do very much worse with their money than to put it in railroads, for though they may have to wait for a return on the investment in the latter the return is sure, whereas, in speculation, the odds are generally in favor of loss. If the leading iron men were to agree to organize a general railway movement, the object of which should be to wipe out all railway discredit by taking up the failed lines and putting them on a strong and substantial basis, the whole system would immediately feel the effect, and capital would once more flow freely into that channel. To see this illustrated we have but to look at the case of the Erie Railroad, the plunder of which by financial banditti was a standing warning to capitalists both foreign and domestic, and the recovery of which at once infused new life into railway credit. Another instance is afforded by the case of the Kansas Pacific Railway, which, in consequence of the panic and the sudden paralysis of railway credit, was unable to meet the regular interest on its bonds. Yet, so soon as the real condition of the company could be examined calmly in the light of returning reason, every body saw that with such a work a failure to pay interest must be temporary only, as the company is the main dependence of the State of Kansas and the Territory of Colorado, and owns over eight hundred miles of railway.

To appreciate properly the value of these ventures of American capital we have only to examine attentively those made by British capital in all parts of the world. London has ventured in the Russian, South American, Italian, Indian, Australian, Spanish and American railroads more money than would have paid off the whole of our war debt at its greatest height. It is by these investments that she has commanded foreign markets for her iron. And in none of these investments has there really been any better chance for a return than in the case of our own undertakings. We are accustomed to measure British railway enterprise too much by the mileage in the British Isles, whereas the enterprise has been world-wide like British commerce. The spirit of British commerce has gone abroad all over the world, while ours has been internal. Each has wrought wonders in its way. So it has been with railways and capital.

As the market for our manufactures and our agricultural products has been chiefly sought at home, so the railway spirit must find its chief development and best field of action at home; and, in connection with it, as British capital finds its natural application in foreign lands, American capital finds its natural application on its own soil. This arises from no narrow-minded feeling on our part, but from the fact that we have an immense domain with boundless resources, and a population consuming more of everything per head than any other now existing. It never occurs to any one in England that this outflow of capital all over the world should be arrested, because every man of sense sees that it makes all the world the debtor to England, and the rich returns are visible in a stupendous commerce. But by some strange concurrence of events it seems to be thought here in the seaboard cities that we must arrest the outflow of our capital to fertilize the vast interior of the Republic which has been our quarry.

Very much of the capital we send to the West goes in the shape of rails, iron bridges, car wheels, cars, locomotives, &c., the construction of which gives employment to labor at home. We presume that exchange between the seaboard and the interior is similarly adjusted in other ways. We receive bonds, shares

of stock, barrels of pork, beef, flour, and all that the West has to send us, and we send back rails, engines, dry goods, hardware, groceries, &c. The West cannot become independent of us while she goes on drawing thus upon our resources to build her railroads. Her cities may become metropolitan, her tradesmen enterprising, her manufactures extensive; but the debt she is ever accumulating here gives us command of the Western trade. Thus, then, we see that the true interest of all the seaboard cities, importers and manufacturers, is to go ahead with Western railroad investments, since the capitalization of our ventures and the return of interest upon the investment must be ever increasing.

The weak point of the American railway system is not at the West, but at the South, where all investments of capital have fallen into disrepute in consequence of the chaotic condition of the State finances. Large numbers of railways are directly affected by the repudiation of the State bonds issued to aid them. We should think it would pay the Northern capitalists concerned in Southern bonds to appoint a general committee to make some arrangement for the reorganization of Southern credit. If the Southern railways could be thus put in a fair way to obtain increased capital, they would all be improved very much, and would be able to use at least 300,000 tons of iron in that section this season. They do not want new railroads there so much as the improvement of those they already have, and that cannot be made without more capital.

A Copper Whistle of the Carboniferous Age.

The Scranton *Republican* tells the following curious story with a gravity which is almost as amusing as the story itself:

"On Saturday afternoon a miner named Martin Loughery, working in No. 10 mine of the Pennsylvania Coal Company's Works, at Pittston, while in the act of breaking a massive piece of coal, which he had dislodged, discovered embedded in the center of it what appeared to be a small wooden box of an oblong shape. Upon touching the box it crumbled into dust like a fungus, and disclosed a copper whistle, having a flint mouthpiece, and in other respects shaped like our ordinary tin whistles. The miner brightened it up, applied it to his mouth, and made it sound, doubtless, for the first time in centuries. The spot where it lay is about one hundred feet beneath the surface of the earth. How many seasons have been swept over the terrestrial sphere, by the never ceasing tide of time, since this memento was laid carelessly aside by some hand of a former age, is a question to form food for the reflective mind. The voice that was wont to charm the single pipe into music must have been blushed in the age of long ago. Yet the copper whistle remains to attest in favor of the science of geology. It should be preserved in some of our museums, or by some historical society, together with a specimen of the structure in which it has slept for ages. Who shall say, in the face of such a fact, that our country has not known a civilization anterior to that imported here by Columbus, or that a race of enlightened human beings did not flourish and fade on this grand hemisphere ages and ages ago?"

This is very interesting, certainly, but it is much to be regretted that the gentleman of paleozoic antiquity who made this whistle, and whose breath "was wont to charm the single pipe into music," did not leave his dagneroose-type in the box along with it, also his card. It would be interesting to know his name, but still more so to see his picture. Of how much greater antiquity the art of making copper whistles must be than is supposed.

Leather Cardboard for Roofing Purposes.

A French writer, discussing the respective advantages of the several varieties of paper roofing lately introduced on the Continent, says:

Although the advantages of bitumen cardboard for covering slight or temporary structures are generally known, many inconveniences from its use. Its rapid decomposition and want of solidity when the oily parts of the bitumen evaporated, necessitated such frequent recoating that the system became expensive rather than economical. A new substance has, however, been lately discovered, known as leather cardboard, which, from its solidity, suppleness and durability, seems likely to supplant the old method of roofing. It is composed of solid and tough materials, cemented together by an oily and durable plastering, with which they are thoroughly impregnated, thus producing a substance entirely waterproof and far more lasting than bitumen cardboard, which, formed as it is of a spongy, compressible material, and only covered with a thin layer of pitch, obviously possesses neither of the qualities essential to any material for roofing—that is, absolute impenetrability added to great powers of resistance.

The leather cardboard, on the contrary, is so waterproof and tenacious in its composition that atmospheric changes have no effect upon it; it can bear the most intense heat and cold without injury, and is capable of resisting not only the heaviest rain, but also the effects of continuous snow.

Being of light weight and easily fixed, the leather cardboard has the advantage of being far more economical than ordinary methods of roofing with zinc, tiles or slate.

Employed, as it has been for several years, as much in private structures as for camps and public edifices, its advantages have been proved by experience, and ten medals awarded to the inventor at different exhibitions have justly rewarded the improvements he has effected.

The cardboard should be laid on planks of wood, touching each other, and at an inclina-

tion of about five inches. The bands of cardboard should be unrolled lengthwise on the roof, commencing at the gutter, and going gradually up to the top.

Care must be taken to stretch the cardboard well, and to make each sheet lap over the other above two inches, securing them by nails at intervals. The whole is ultimately fixed from the top to the bottom of the roof by little wooden linters, less than an inch wide, nailed at a distance of about 18 inches from one another. A coating of hot pitch should then be applied.

The sheets of leather cardboard being sanded only on one side, care must be taken to fix the smooth side to the planks. The price varies according to the thickness of the sheets, but is much the same as that of ordinary cardboard.

The First Steel Rail.

A correspondent of *Iron* tells the following interesting story of the first steel rail: In the early part of the year 1857, Mr. Musket, the eminent metallurgist, cast for the Ebbw-Vale Iron Company some blooms of Bessemer steel. Some of these were rolled into double-headed rails at the Victoria Iron Works. One of the rails, after being inspected by Mr. Musket, was sent to Derby station, where it was laid down at a place where there was the greatest amount of traffic. Ten years after, Mr. Musket wrote to the chief engineer of the Midland Railway, at Derby, asking what number of trains passed over it daily, and whether the railway company would dispose of the rail to him. In reply he was told that the number of trains daily passing over the rail was 250, but that might be at least doubled for detached engines and tenders, and the engineer added: "I should not be inclined to recommend the sale of the rail, but if it is ever taken out you shall have the refusal of it."

In June of last year Mr. Musket wrote again about the rail, reminding the engineer of his promise, and this was the reply: "I am sorry to find that the rail referred to in your letter of 16th June was taken out and used about ten days before the receipt of your letter."

It is undoubtedly a great pity that this Bessemer steel rail, the first cast steel rail that was ever laid down upon any railway, should not have been preserved. A hundred years hence it would have possessed great value as an object of interest and curiosity.

The facts of the case are these: During sixteen years 250 trains and at least 250 detached engines and tenders passed over this line daily. Taking 312 working days in each year, we find the enormous total of 1,252,000 trains, and 1,252,000 detached engines and tenders which actually passed over this rail from the time it was first laid.

The uses of wire-rope—at first almost entirely confined in its practical application to the standing rigging of ships—are now almost innumerable. Among the most prominent of these uses, in addition to the standing and running rigging of ships, may be mentioned submarine cables for telegraphing; suspension bridges; guide, incline and flat ropes, for mining purposes; special forms of rope for engineering uses; pneumatic telegraphs; traction ropes for tramways; steel plow ropes; ropes for the transport of sugar-canes; tent stay ropes; endless driving bands; bullock traces; telegraph running and stay strand; fencing strand; ropes for staving; railway single cords; clock lines; clothes lines; sash lines; lightning conductors; gilt and silvered cords for hanging pictures, etc., etc. Many other applications might also be enumerated; while for all these purposes they are believed to be stronger, lighter, cheaper and more durable than any other article thus employed. These ropes are manufactured from cast, homogenous and Bessemer steel; also, from charcoal and common brands of iron, bright or annealed, and from copper and brass.

A new snow-plow has been tested on the Flushing and North Side Railroad, Long Island. It is built on a platform car about 30 feet long. In front is placed a frame 12 feet long, elevated at an angle of 45 degrees, the top of which is on a level with the front of the car. The part that first strikes the snow is at the bottom of this frame. It is an iron plate and nose, and receives the snow, which is then caught up by iron buckets, four feet wide and eight inches high, attached to endless belts of rubber, revolving on cylinders of oak and iron, and thus carrying the snow to the tops of the frame and throwing it upon the roof.

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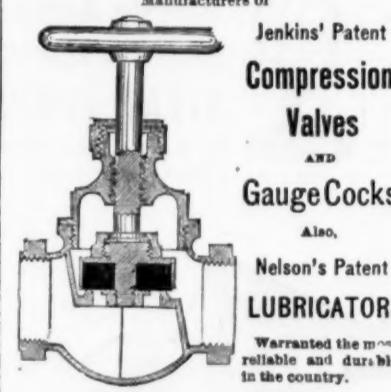
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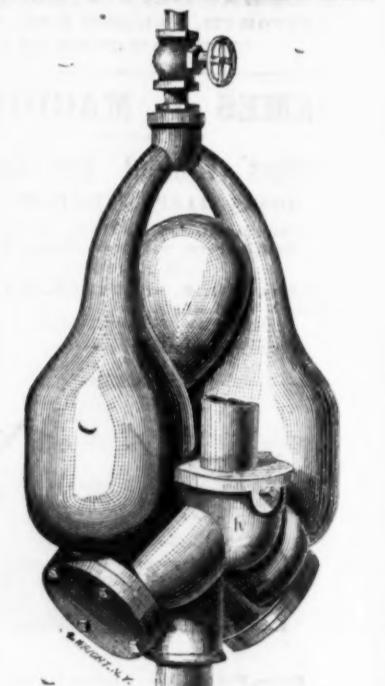
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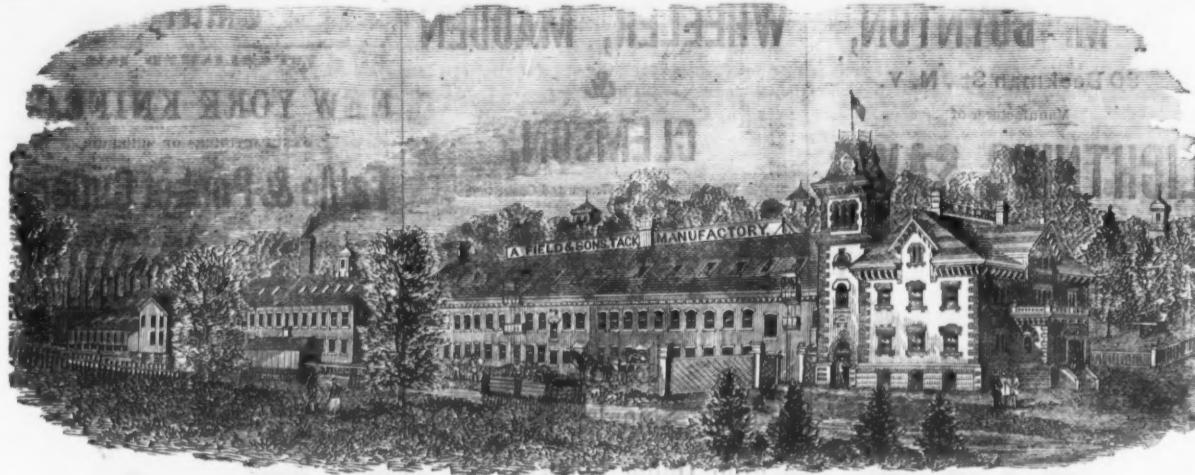
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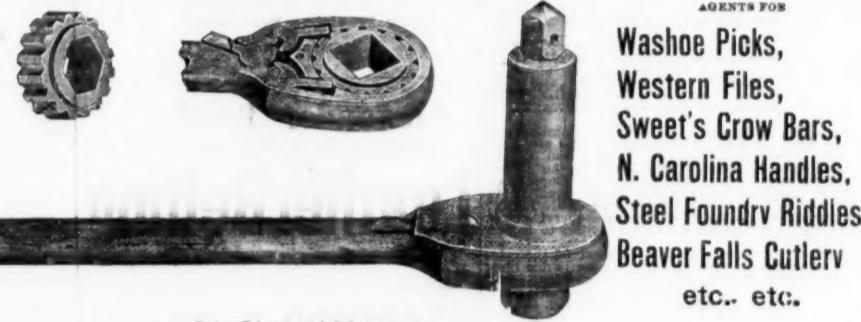
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How One Works.

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Dear Sirs: The experience of a year proves that your Furnace Elevator is superior to all others in use. We have in the six weeks from December 1st to Sunday last, 12th Inst., made 9724 tons, 140 lbs. Pig Metal, or an average of near 65 tons per day, which required the elevator to lift 72 feet high 4½ tons Ore, Coke and Limestone for each ton of metal produced, or more than 11,500 tons material in the 6 weeks. The largest yield in one day was 81 1-4 tons Iron, involving the lifting of 340 tons material in 24 hours. This has all been done to our satisfaction, and that, too, in the great difficulty, on account of the water freezing in the tanks; and in the case of the air holes, we understand that two furnaces, not far from us, had to "blow out," from being unable to hoist stock during the "cold snap." The difficulty, we are told, was caused by the condensed moisture in the blast freezing to the sides of the cylinders, so that the piston could not move up or down.

Very truly yours,
DEWEY, VANCE & CO.

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Bolts, Nuts, Turnbuckles, Washers, forgings, &c.

The attention of large consumers solicited.

BUSINESS ITEMS.

PENNSYLVANIA.

New machine works are being erected at Lebanon by P. L. Weimer, of the firm of P. L. Weimer & Bros. Their old establishment will soon be started.

The Manayunk Machine Works, at Philadelphia, have been established since 1857. The company manufacture machinery, shafting, pulleys, &c., employing about 35 workmen. The shop has a frontage of 200 feet on Main street, and is supplied with a full equipment of modern machinery, &c., necessary for conducting this branch of manufacture. The proprietors are Muldoon & Hutton.

It is stated that arrangements have been made by which the Johnstown Mechanical Works will shortly be run again to their full capacity.

Alexander Foster & Co., proprietors of the Fairmount Steel Works, Philadelphia, are manufacturing a large amount of cast steel; also, machinery steel, frog plates and points, cast spring steel, and all kinds of steel forgings, made to any pattern. In the works are six four pot melting furnaces, and three steam hammers. The company employ 30 workmen. The mill has a capacity of eight tons per week.

It is rumored that the railroad company is at present engaged in negotiating for a tract of land in the vicinity of Derry Station, Westmoreland county, with the view to erecting thereon the necessary shops for the building of palace stock cars, and, also, shops for repairing locomotives that ply on the western division. If rumor is correct the shops that are to be erected will be on an extensive scale, and will be fitted up with the most approved machinery of all kinds, while Derry Station will at once take rank with the important points along the line of the road.—*Altoona Tribune.*

William M. Kaufman & Co. are building a new iron furnace at Sheridan, Lebanon county. This concern are the proprietors of the Sheridan Furnace, at Sheridan Station. The new furnace will be 65 feet, and 16 feet at the bosh.

Charles M. Wheatley's Copper Works, at Phenixville, is proving successful in the manufacture of copper. The ore from which it is melted is the product of Pennsylvania, and the works have a capacity of 25,000 pounds of ingot copper per month, of a quality claimed to equal the best brands of Lake copper.

William Stevens' Tool Manufactury, at Philadelphia, is actively employed in the production of stone cutters' tools, mill picks, &c. He is the successor to Joel Lane, who formerly carried on the business. Mr. Stevens makes a specialty of the above class of tools, which bear an excellent reputation.

Work has been resumed at the Presque Isle Iron Works, Erie.

Waterman & Beaver's Rolling Mill, at Danville, is again in operation.

A large pair of chilled rolls were recently shipped to Belgium by A. Garrison & Co., Pittsburgh, to be used by a manufactory in that country.

The Bethlehem Iron Company have resumed work in all their mills, with the exception of one devoted to steel manufacture.

MASSACHUSETTS.

The annealing house of the Plymouth Rivet Works, at Plymouth, was burned Feb. 9, involving the company in a loss of \$3000; insurance, \$1300.

MAINE.

The rifle factory at Mechanic Falls will soon be in active operation. The machinery is being manufactured, and the works are making rapid progress toward completion. This new enterprise is under the management of the Evans Rifle Manufacturing Company.

RHODE ISLAND.

The Providence Brass Foundry, of which Mr. A. H. Manchester, is proprietor, has been in existence over a quarter of a century. At the works various kinds of machinery, railroad and ship castings are manufactured, a specialty being made of calendar rolls and paper mill works. The foundry is thirty-two feet square, and gives employment to six hands. The shop is used for making rolls 40x40 feet. A reverberatory furnace is used. The machinery includes five lathes, boring machines, drilling machines, &c. The rolls are sold to bleachers and paper mills in all parts of the country. Mr. Manchester also makes copper single plates, weighing from 500 to 1000 pounds each, for singeing cloth. A four-horse engine furnishes the power.

ILLINOIS.

The rail mill belonging to the Springfield Iron Co. was started up double turn on Wednesday, the 11th inst., on an order for 52 lb. rails. By the afternoon of the 14th 508 tons were finished. The amount would have been considerably larger had the rails been of heavier section, but we think it shows a very good capacity for a new mill. All the heating and a part of the puddling is done in Siemens' gas furnaces, and the quality of iron produced is entirely satisfactory to the company. The furnaces are also said to be very economical in their operation.

The works of Boomer, Jenks & Casper, at Chicago, are devoted to the manufacture of galvanized iron cornices. The company turn out about \$75,000 worth of goods annually, and employ some forty workmen. Robert Griffiths, in the same line, manufactures over \$100,000 worth of goods, and employs sixty hands.

Business is brisk at the Zinc Roofing and Ornamental Works at Chicago. This concern employs fifty workmen, and turns out annually about \$500,000 worth of manufactures.

OHIO.

The Marietta Iron Company is the name of the new concern which succeeds the Marietta Iron Works Company, at Marietta. The new company is composed of gentlemen of wealth, and the capital has been considerably increased. The rolling mill, which has been closed for some time, will soon be started up again.

The plate mill of the Gaylord Rolling Mill went to work last week Mr. Stone taking his

old place. The guide mills, sheet mill and bar mill are still idle, and only about 60 men are now out of employment.

The Alliance Rolling Mills, at Cleveland, were burned February 5. Loss, \$40,000.

The Falls Wire Works, of Akron, employs 25 men and turns out a ton of wire daily.

The Connellsville Coke Trade.

Frank Cowan's Paper gives the "state" relative to the recent advance in the tariff for coke by the Pennsylvania Central and the Pittsburgh, Washington and Baltimore companies, as follows:

The Pennsylvania Railroad refuses to receive at Brinton any coke shipped at Broadford, and points east of Broadford, on the Mt. Pleasant Branch. This is to force the trade over the Southwest Pennsylvania Railroad, via Everson, from which point to Pittsburgh the rate has been raised from \$10.80 to \$13.80—an advance of half a cent per bushel, and ruinous to business, for it annihilates the margin of the Pittsburgh middleman who has taken any contracts at six cents per bushel on the wall. This action of the Pennsylvania Railroad, moreover, is said to be not only to secure freightage over the Southwest Pennsylvania Railroad, but also to foster the manufacture of coke on that happy road which vaguely hopes to be able to supply the whole demand for coke if properly encouraged. Then to block this little game of the Pennsylvania Railroad, the Pittsburgh, Washington and Baltimore Road—the general freight agent's published flat denial to the contrary—raise the rates on the Mt. Pleasant branch to Everson from \$4.28 to \$4.50—an advance of twenty-two cents, and an advance which, when added to the Pennsylvania Railroad's \$13.80, puts it beyond the power of any manufacturer on the branch to compete with those on the main line near Pittsburgh, or those on the Southwest Pennsylvania Railroad. The consequence is, the shipping of coke from the Mt. Pleasant branch works has entirely ceased, the works are running forty-eight and seventy-two hour coke, and the yards are rapidly being blocked up with the increasing stock; thousands of laborers are threatened with a total suspension of work, and a general gloom and depression prevails.

How long this unhappy state of affairs will continue is not known, but it is surmised it will be of short duration. The Pittsburgh, Washington and Baltimore road is anxious to go back to the old rates in vogue before February 1st, is anxious to encourage the trade, and will, rather than grievously hinder it by its deadlock with its rival, carry coke at six dollars per car from the coke regions to the depot at Pittsburgh, whence, in wagons, it will pay to cart it across the city for re-shipment on Western roads. The road that can reduce the fare from Pittsburgh to Washington to four dollars, can reduce the rates on coke from the Mt. Pleasant Branch to Pittsburgh to at least a figure that will pay the manufacturer and the shipper.

A New Plate Glass Enterprise in Missouri.

At Crystal City, Missouri, which is situated about thirty miles south of St. Louis on the Mississippi River, an establishment of plate glass has recently been erected. The buildings are situated on the west bank of Platin Creek, and owned by the American Plate Glass Co. The bluff near which they are situated is described as a vast mine of white saccharoid sand of unsurpassed excellence and inexhaustable quantity. The analytical tests of the sand give the following approximate results: Silica, 99.62%; iron, .09; magnesia, .11; lime, .07; total, 99.89. This indicates an unusual proportion of silica. Overlying this body of glass sand is a cap of pure limestone, layer upon layer of white, blue and gray stone, and including a vast supply of the best fluxing for the manufacture of plate glass in the world. There are coal fields in the immediate neighborhood, and almost all the necessary materials for the manufacture of plate glass are within easy reach.

The American Plate Glass Co. was organized in 1872, with a capital stock of \$250,000, which has been increased recently to \$500,000. They began operations about a year and a half ago, and have already erected buildings consisting of a finishing hall 742 feet in length by 120 feet in width; a pot house, 40 by 100 feet; a clay shed, 48 by 96 feet; a furnace room, 50 by 114 feet; a plate house, 144 by 206 feet; an ename house, 40 by 118 feet; two boiler houses, each 38 by 40 feet and a blacksmith's shop 30 by 50 feet, besides a number of other buildings that are in course of construction.

Some idea of the works can be formed from the fact that if we conceive the buildings already finished in a line, we shall have not less than a quarter of a mile of continuous brick buildings. When in full working order the company expect to turn out 30,000 feet of polished glass each week. They are very sanguine of success, and from the circumstance that all the necessary materials are lying close at hand, and can be obtained at very low prices, there is every prospect of their hopes being realized.

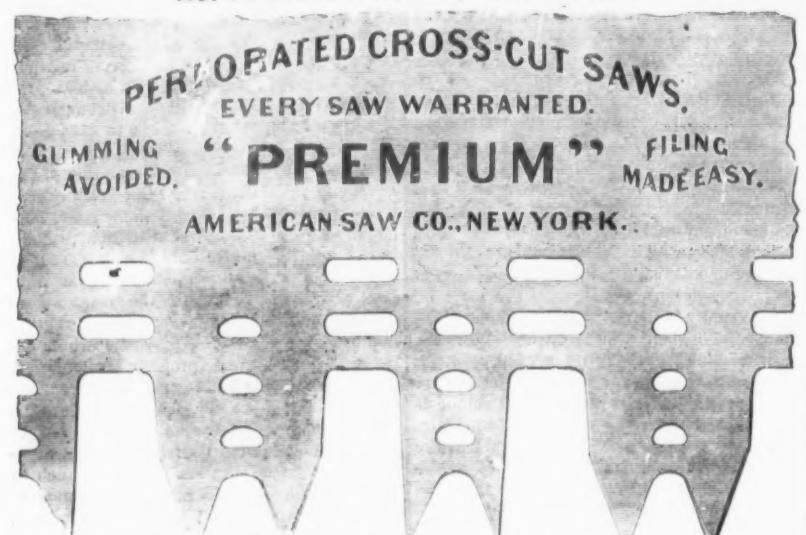
A despatch from Pittsburgh records the occurrence of a frightful accident at the steel works of the Cambria Iron Company, Johnstown, Pa., on the 11th inst., by which three persons were fatally injured and thirteen others more or less seriously burned. A large ladle, containing five tons of molten steel, was overturned and showered the hot metal over sixteen men. Mr. Wilcox, the foreman, was among those injured. Some of the men had the clothing all burned from their bodies, even to their shoes. The company will look after the comfort of the men until they recover.

Warwick & Co.'s Foundry Burned.

A few days ago the foundry of Messrs. Warwick & Co., of Pittsburgh, was destroyed by fire. Before the firemen reached the ground the entire building was enveloped in a mass of flame that defied the most strenuous exertions. In less than an hour the structure was a mass of ruins. The loss is estimated at \$12,000, on which there is a partial insurance. The origin of the fire is unknown, but it is a curious fact that it started very near the spot where the great fire of 1845 was first discovered.

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SAWS OF ALL KINDS.
FACTORY, WILLIAMSBURGH, N. Y.

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MOVABLE-TOOTHED CIRCULAR SAWS AND SOLID SAWS OF ALL KINDS.

Hankins' Elliptic Forked Saw Frame.



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ROCHESTER, N. Y.

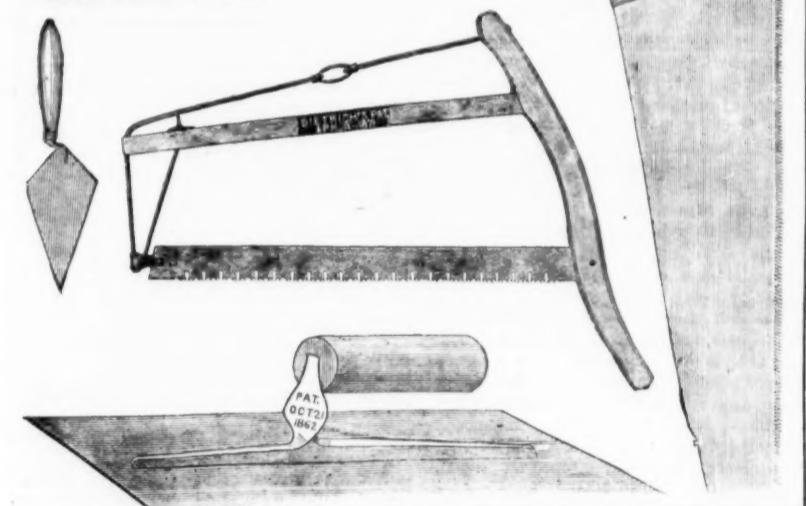
Dietrich's Patent Wood Saw. Guaranteed the strongest, lightest, easiest to strain or tighten and best braced wood saw made; also to give perfect satisfaction.

Dietrich's Patent Double Handle Rip Saw. All will readily see the benefit of this useful invention.

J. Flint's Patent Plastering Trowels. The best made and finished trowels in the world. We make four grades of Plastering Trowels, from the best to the cheapest.

Our patent method of grinding hand saws makes them superior to any in the market.

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Manufactured from the best of **NORWAY** Iron, and warranted to give entire satisfaction.

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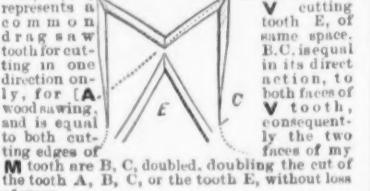
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A Challenge of \$500, toward expense of a public test, to prove that the Lightning Saw, exceed all others in cutting power, was issued by the American Iron and Steel Association, at Albany, N. Y., in 1867, and has never been accepted. More than 10,000 Lightning Saws were sold during the year 1873, the purchasers of which testify to their superior merits.

Our leading papers, such as the *Times*, *Union*, etc., have published over sixty editorial notices recommending these Saws. Farmer's Clubs, Lumbermen, and Hardware Dealers unite in pronouncing the general Lightning Saw the greatest and safest implement of the age.

I have hundreds of letters from practical sawyers, voluntarily written, expressing their entire approval of these Saws.



This is produced by dressing the two points of my **M** tooth, to cut in line with the outside of **C**, has four times the space of the slant edge behind it, or from 1 to 5, while slant has space from 1 to 4, the inefficient slant edges are thus practically concealed and do but slight surface cutting, while **B**, **C**, edges cut and clear simultaneously.

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Extra Cast Steel Saws of every description.

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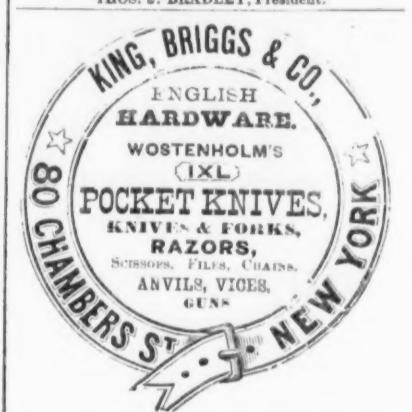
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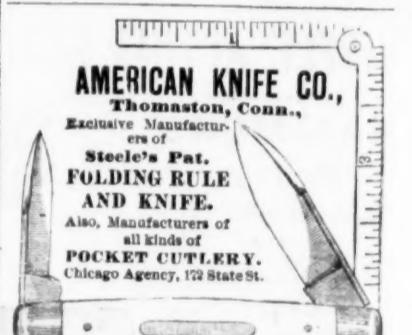
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PITTSBURGH.

PITTSBURGH, Feb. 14, 1874.

General business continued fairly active, as much as usual at this particular season, if anything better than it was at the corresponding time last year. The effects of the recent panic are scarcely perceptible any longer, and money matters, there is reason to believe, at least so far as relates to Pittsburgh, are working easier than at this time in 1873, although the majority of our manufacturers are anxious for expansion, claiming that there is not enough currency in the country to do the business. Our rivers are again in navigation, and there is reason to believe, as confidence has been pretty well restored, that there will be an unusually heavy spring trade. Our manufacturers are confidently expecting it, and it is earnestly hoped that their expectations may be fully realized.

Pig Iron.—Trade has been moderately active during the past week, but the market continues comparatively quiet, and presents nothing really new or particularly important. The demand is general, but is still confined to supplying immediate wants. Confidence seems to be impressed with the belief that there is no probability of any immediate advance, hence they are buying sparingly, and, as a consequence, there is less doing, and the market is scarcely as strong as it was a few weeks since. Furthermore, some of the mills are pretty well stocked, having contracted freely in January, and these, for the time being, are out of the market altogether. Producers, however, do not appear to have had their confidence shaken as yet, while forced to admit that the market is less active and weaker, they claim that all they have to do is to bide their time; hence, they are not pressing the market, knowing that such a course would have a bad effect, and the most of them are now in such a position financially, that they are able to hold their product, if necessary, while others have contracted ahead for what they can make during the next thirty days.

Foundry Metal.—Trade has been moderately active during the past week, but the market continues comparatively quiet, and presents nothing really new or particularly important. The demand is general, but is still confined to supplying immediate wants. Confidence seems to be impressed with the belief that there is no probability of any immediate advance, hence they are buying sparingly, and, as a consequence, there is less doing, and the market is scarcely as strong as it was a few weeks since. Furthermore, some of the mills are pretty well stocked, having contracted freely in January, and these, for the time being, are out of the market altogether. Producers, however, do not appear to have had their confidence shaken as yet, while forced to admit that the market is less active and weaker, they claim that all they have to do is to bide their time; hence, they are not pressing the market, knowing that such a course would have a bad effect, and the most of them are now in such a position financially, that they are able to hold their product, if necessary, while others have contracted ahead for what they can make during the next thirty days.

Hot Blast Charcoal.—Mr. GEO. H. HULL, under date of Feb. 16, writes as follows: The demand for Forge Iron is again failing off, there being no immediate prospect of the mills resuming work, and the market for this grade is quiet but firm. There is a moderate demand for Foundry metal at ruling quotations. The usual time, four months, is allowed on quotations below:

LOUISVILLE.

Mr. GEO. H. HULL, under date of Feb. 16, writes as follows: The demand for Forge Iron is again failing off, there being no immediate prospect of the mills resuming work, and the market for this grade is quiet but firm. There is a moderate demand for Foundry metal at ruling quotations. The usual time, four months, is allowed on quotations below:

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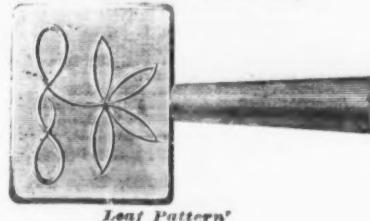
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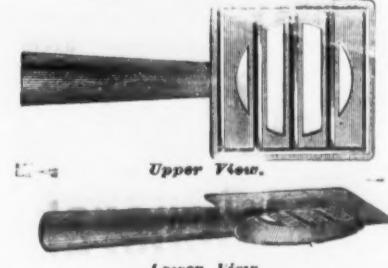
No. 6 Fifth Wheels.



1871 Pattern Shaft Couplings.



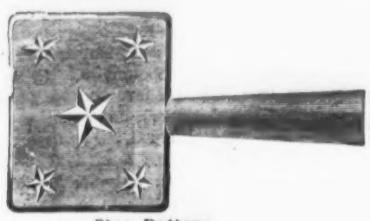
Patent Cross Bar Steps.



Upper View.

Lower View.

Solid Plain Pattern Steps.



Star Pattern.

Smith's Improved Philadelphia Pattern Slat Irons.



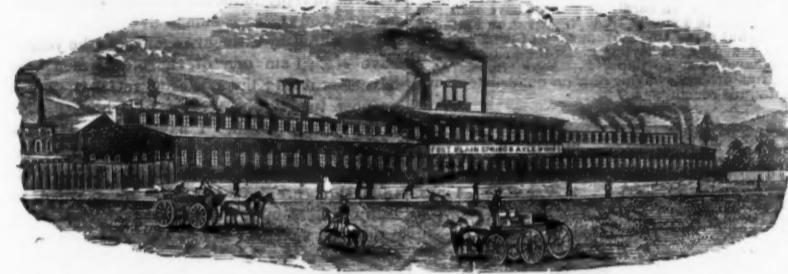
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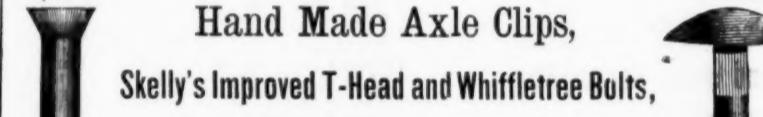
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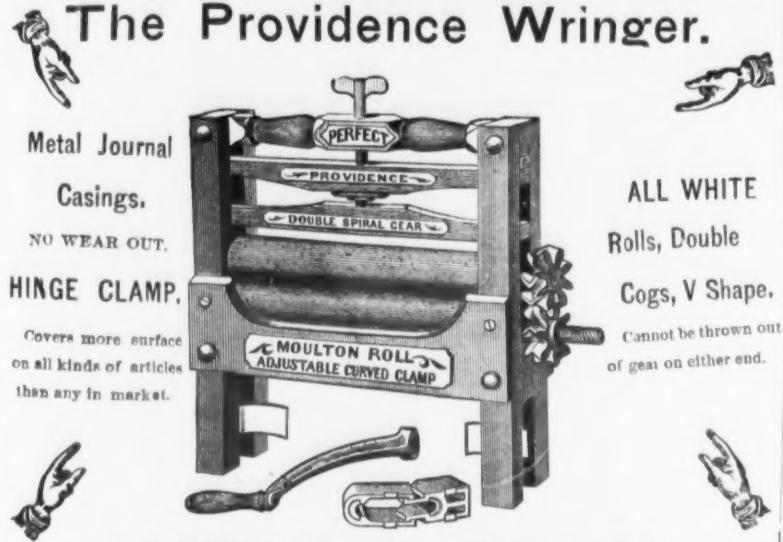
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Borax.	Beach & Co., Hartford, Ct.	24
Brass, Manufacturers of.	American Brass and Copper Co., 19 Cliff, N. Y.	2
Brodell & Russell Mfg. Co., Waterbury, Conn.	2	
Coe Brass Mfg. Co., woolcotting, Conn.	2	
Miller Edward & Co., 4 Warren, N. Y.	2	
Plume & Atwood Mfg. Co., 89 Chambers, N. Y.	2	
Seovill Mfg. Co., 4 Beckman, N. Y.	2	
Wright Bros. Mfg. Co., 52 Beckman, N. Y.	2	
Brass Castings.	Holland T. & Co., 8 Gold, N. Y.	36
Brick Presses, Makers of.	Brick Press Makers of, 1819 Germantown Ave., Phila.	13
Carnell Geo., 1819 Germantown Ave., Phila.	13	
Carroll F. L. & Co., 184 Germantown Ave., Phila.	13	
Bridge Builders.	Moseler Iron Bridge and Roof Co., 5 Dey, N. Y.	4
Butcher and Shoe Knives, Manufacturers of.	Wilson, John, Shemuel Eng.	28
Butts and Holes, Makers of.	Anderson Bros. & Co., Providence, R. I.	21
American Spring Butt Co., 27 Park Row, N. Y.	21	
Brodell & Russell Mfg. Co., Waterbury, Conn.	2	
Coe Brass Mfg. Co., woolcotting, Conn.	2	
Miller Edward & Co., 4 Warren, N. Y.	2	
Plume & Atwood Mfg. Co., 89 Chambers, N. Y.	2	
Seovill Mfg. Co., 4 Beckman, N. Y.	2	
Wright Bros. Mfg. Co., 52 Beckman, N. Y.	2	
Cabinet Hardware, Manufacturers of.	Lands, Fary & Clark, 298 Broadway, N. Y.	11
Carriage Bolts, Makers of.	Townsend, Wilson & Hubbard, Phila.	12
Carriage Hardware, Makers of.	Smit H. D. & Co., Pittsfield, O.	12
Car Wheel, etc., Manufacturers of.	Hoyle Hammer Makers of, Syracuse, N. Y.	6
Jackson Wood Mfg. Co., Berwick, Pa.	6	
Taylor Iron Works, High Bridge, N. J.	6	
Chains, Makers of.	Holland T. & Co., 1819 Germantown Ave., Phila.	36
Cain, Gordon & Co., 1845 Richmond, Phila.	4	
Kendrick & Runkle, Trenton, N. J.	4	
Wynn Thos., 71 Edy, Providence, R. I.	4	
Chisels, Manufacturers of.	Bush, Bush, Meriden, Mass.	28
Clay Wringers, Manufacturers of.	Providence Tool Co., 11 Warren, N. Y.	11
Coat, Makers of.	Pardee A. Co., 111 Broadway, N. Y.	15
Coat Tods, Manufacturers of.	Easterbrook Wm., 311 Cherry, Phila.	36
Ohio Coal Hod Co., 436 E. Front, Cincinnati, O.	29	
Smith, Burton & Co., 10th, N. Y.	21	
Coffee and Spice Mills.	Dodge Bros., Millbrook, N. Y.	15
Enterprise Mfg. Co., Philadelphia, Pa.	30	
Coil Trimminas, Makers of.	Wayne Hardware Co., Cincinnati, O.	36
Commission Merchants, English.	Goddard Samuel A. & Co., Birmingham, Eng.	6
Compasses and Dividers, Manufacturers of.	Bennett & Carl Hardw. & Tool Co., Springfield, Mass.	21
Conner's Tools, Division in.	Conner's Tools, Division in, 18th and 20th, N. Y.	13
Linn, E., 59 Fulton, N. Y.	13	
Swan & Brombacker, 33 & Fulton, N. Y.	34	
Corrugated stove Pipe Elbows, Makers of.	Corrugated Metal Co., East Berlin, Conn.	4
Corrugated Metal Co., East Berlin, Conn.	4	
Crucibles, Manufacturers of.	Newkumet Adam, 183 N. Front, Phila.	13
Ross & Hoferkamp, 428 W. 6th, Phila.	14	
Stevens & Son, 70 Market, New Haven, Conn.	14	
Taylor Robert & Co., 1900 to 1906 Caldwells, Phila.	14	
Curry Combs, Manufacturers of.	Kellogg W. P. & Co., Troy, N. Y.	34
Cutterly, Importers of.	Hoyle Hammer Makers of, 1819 Germantown Ave., Phila.	36
Hoyle Hammer M., Co., 101 Beckman, N. Y.	29	
Dickinson Henry, 66 and 88 Reade, N. Y.	11	
Hoyle Hammer M., Co., 101 Beckman, N. Y.	29	
Friedman & Lauterling, 14 Warren, N. Y.	11	
King H. & W., 80 Chambers, N. Y.	11	
Peace Chas., Jr., 52 Chambers, N. Y.	11	
Peters Bros., 54 Chambers, N. Y.	11	
Taylor Thomas, 43 Chambers, N. Y.	11	
Tillman A. & Co., 51 Commerce, Phila.	10	
Ward Asline, 101 Duane, N. Y.	10	
Wilson Hardware, Elmer & Co., 50 John, N. Y.	32	
Smith Hall, 100 Chambers, 100 Reade, N. Y.	11	
Taylor Thomas, 43 Chambers, N. Y.	11	
Cutterly, Manufacturers of.	Hoyle Hammer M., Co., 101 Beckman, N. Y.	36
American Knife Co., Thomaston, Conn.	10	
Burkinshaw Amor, Pepperell, Mass.	11	
Landers, Fred. & Co., 298 Broadway, N. Y.	11	
McBride Cutlery Co., W. Meriden, Conn.	11	
New York Knife Co., Walden, N. Y.	11	
U. S. Steel Shear Co., W. Meriden, Conn.	11	
Woods Cutlery Co., Alford, N. H.	10	
Dredging, and Makers of Dredging Machines.	McDowell, W. T. & Co., 214 Delaware ave., Phila.	15
Am. Dredging Co., 214 Delaware ave., Phila.	15	
Drill Chucks, Manufacturers of.	Hunt F. A. & Co., Danbury, Conn.	34
Drilling Machines, Makers of.	Millett F. & Co., 78 Beckman, N. Y.	29
Thorne & Dehaven, Philadelphia, Pa.	35	
Edge Tools, Makers of.	Bradley G. W., 35 Chambers, N. Y.	16
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Howard Geo. C., 17th & 18th, Phila.	36	
Our Bros. & Co., 346 Broadway, N. Y.	9	
Emery.	The Union Stone Co., 16 Exchange, Boston.	21
Emery Cloth.	The Union Stone Co., 16 Exchange, Boston.	27
Emery Wheels, Makers of.	Tente Company, Stroudsburg, Pa.	27
The Union Stone Co., 16 Exchange, Boston.	27	
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Enterprise Mfg. Co., of Pa., Phila.	35	
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Faucets, Self-Closing, Makers of.	Moss F. W., 90 John, N. Y.	16
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Faucets, Self-Closing, Makers of.	Spears & Jackson, 98 Chambers, N. Y.	13
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Shuttlecock & Co., 35 Chambers, N. Y.	3	
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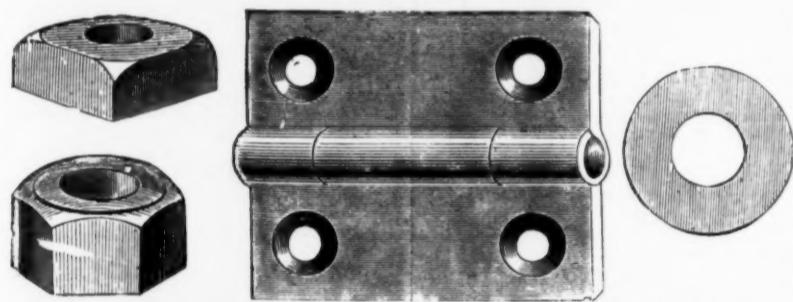
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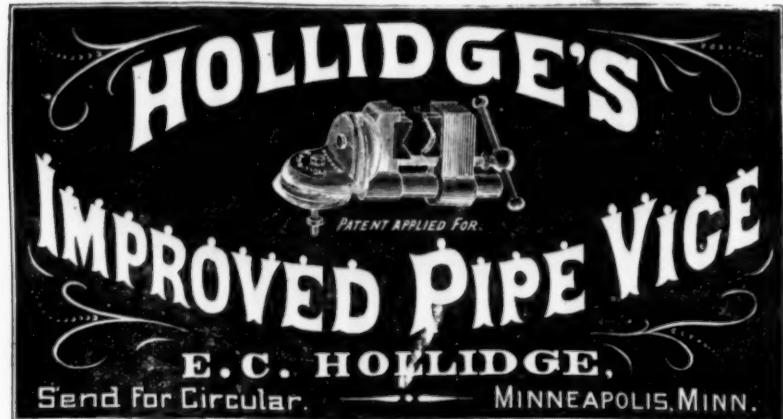
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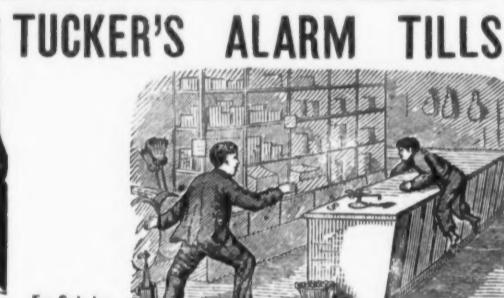
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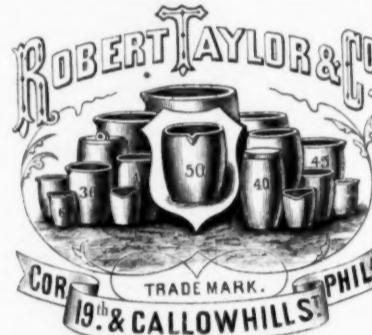


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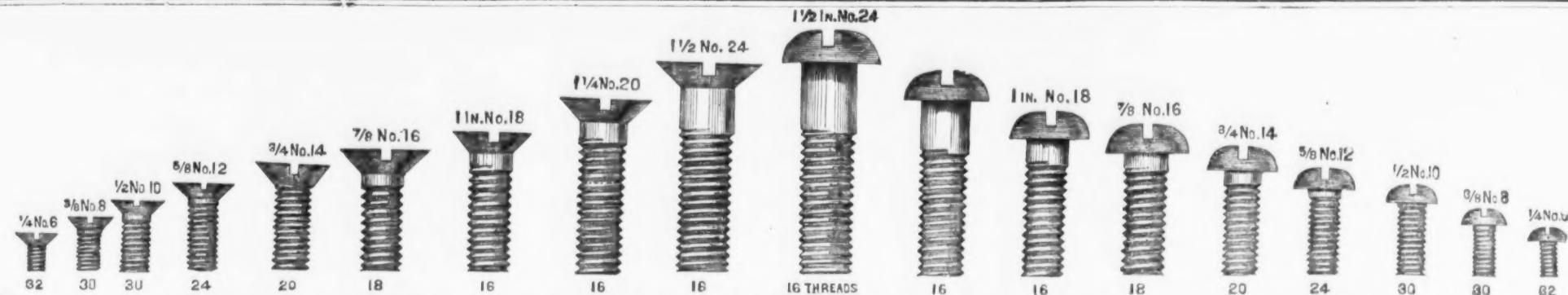
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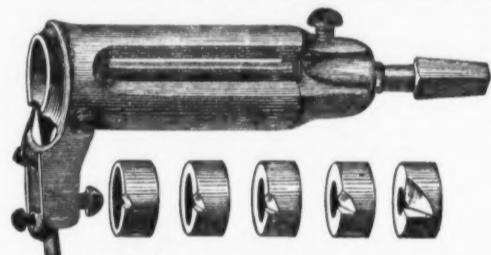
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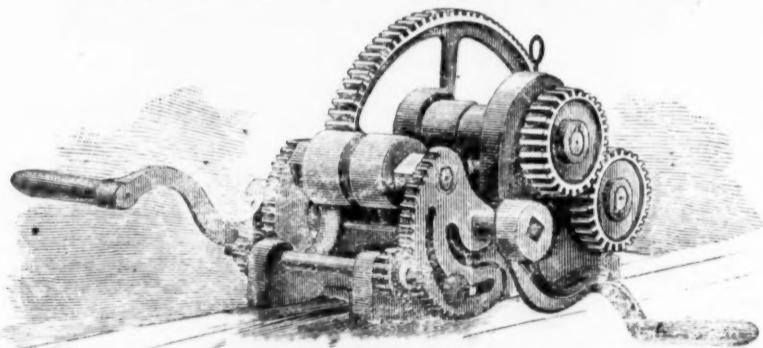


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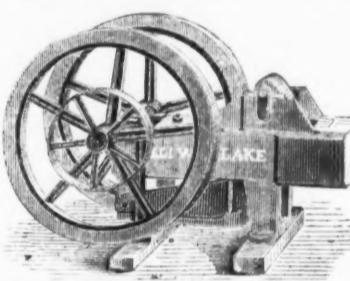


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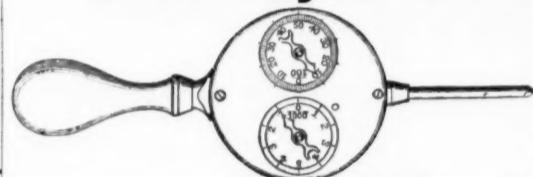
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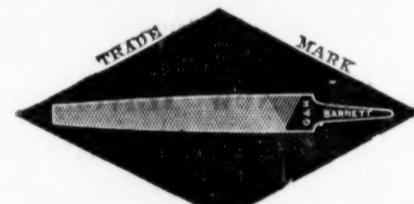
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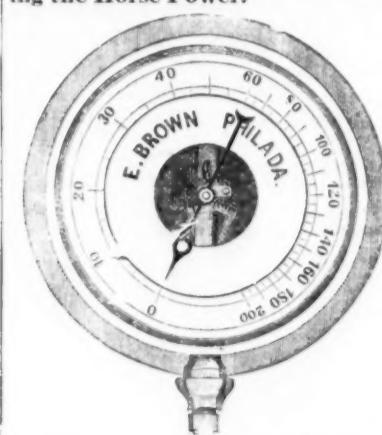
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The undersigned, commercial Editor of *El Cronista*, the Spanish Government paper in this city, and Foreign Editor and Translator of the *Daily Bulletin*, has made a specialty for years past to translate industrial matter with the greatest exactness to the technical wording, from and into English, German, French and Spanish for manufacturers, patentees and others, and begs to be recommended to the iron masters and trade in that capacity.

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The Iron Age.

New York, Thursday, February 19, 1874.

DAVID WILLIAMS . . . Publisher and Proprietor.
JAMES C. BAYLES . . . Editor.
JOHN S. KING . . . Business Manager.

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City Subscribers will confer a favor upon the Publisher, by reporting at this office any delinquency on the part of carriers in delivering *The Iron Age*; also, the loss of any papers for which the carriers are responsible. Our carriers are instructed to deliver papers only to persons authorized to receive them, and not to throw them in hallways or upon stairs; and it is our desire and intention to enforce this rule in every instance.

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Are We on the Eve of a Mechanical Revolution?

The many and important discoveries and improvements made during the past few years in the generation and utilization of power, has created in the public mind a vague idea that, possibly, we are on the verge of a mechanical revolution, and that before long electricity, magnetism, tide power or something else will perform, at a nominal cost, the varied functions of steam as a motive power. The existence of this idea is, doubtless, due in a great degree to the manner in which certain unimportant and, generally speaking, unsuccessful experiments have been hailed by the newspapers of this and other countries as discoveries which must soon create a mechanical revolution; and the fact that these glorious predictions are never realized does not seem to have suggested a doubt that they ever will be. Few persons who have much knowledge of mechanical engineering, either theoretical or practical, look for an immediate solution of the problem of "power from nothing, or next to nothing," which, like perpetual motion, has long been the dream of impractical inventors and theorists; but the number, even of these, who believe that a great discovery in mechanical engineering is about to be made, which will give us cheaper power than we now have, is great enough to call for a serious and thoughtful consideration of the question at the head of this article.

For the first twenty centuries of the world's history, men made but little progress in the utilization of nature's forces. What man accomplished was the work of his hands, supplemented in some instances by the strength of domestic animals, which

were employed to a limited extent in drawing loads, carrying burdens and, sometimes, in elevating water for purposes of irrigation. As the rule, however, the work of the world was performed by manual labor, and so ignorant were the most civilized nations of the use of power that the wind was regarded as a hindrance, rather than a help, to navigation, and ships were propelled by oars.

The next thousand years saw the power of wind applied to pumping water, and to the propulsion of ships. In the latter, however, it was only auxiliary to the oar. About the same time water wheels were employed in the extreme East, to drive pumps or other machines for raising water. But with the exception of a few corn mills and the rude wheels for raising water, the world's work, for nearly four thousand years, was performed by man's unaided strength, the rare exceptions being scarcely worth the notice. Indeed, in navigation, in which progress has always been rapid, it is less than a thousand years since the wind was first used for the propulsion of ships, unassisted by men at the oars. This step was probably much hastened by the Norsemen, whose stormy seas prevented a great reliance in human strength. All these steps were slow, and century after century passed with no perceptible change in the general state of the arts, as regards the utilization of the forces by which man was surrounded.

It is now only about two hundred years since civilization attained a point which rendered power a necessity. Men alone were not strong enough to do the world's work. Then began an interesting era of mechanical progress. The Dutch engineers did wonders with the windmill, and brought up its efficiency to a point that is hardly to be excelled at the present day. Smeaton attacked the wasteful water wheels, and succeeded in bringing their "duty" up to a remarkable figure. Mining industry called for pumps, for water must be raised or mining must be stopped, and cities must have water or they could not exist. Savary, the Marquis of Worcester, Papin, Newcomen, and many others, had in a rude way started the steam pump, and kept many a mine from bankruptcy by keeping the water down; and Smeaton and Watt almost simultaneously attacked the problem of raising water by steam power, the one as an engineer and the other as an inventor. Smeaton so greatly improved the atmospheric engine, or steam pump, as it is more properly termed, that it was for a long time a sturdy competitor with Watt's improved machine. Watt was, strictly speaking, the father of the Cornish steam pump, and nothing more. In the meantime there grew up in England and on the Continent, as well as in this country, a demand for cheap and convenient power, which was met in part by the invention of the high-pressure steam engine in this country, and the almost simultaneous application of the atmospheric engine to produce a rotary motion. Before it had been necessary to take the manufactory to the waterfall; now the power could be created where it was needed.

With these improvements, made less than a century ago, began a new era of civilization, characterized by a rapid industrial progress and commercial development. Production increased in a ratio more than proportionate to the decrease in the labor expended in producing, knowledge spread with the extension of better facilities for intercommunication, new wants were experienced only to be satisfied by new products, the luxuries of the past became the necessities of the present, and the enjoyments of life were increased an hundred fold. This progress was the result of a brilliant series of experiments and discoveries, which led gradually nearer to the maximum of economy in production, and for a long time it seemed as if that maximum would not be reached until production was so cheap that universal abundance would prevail, and life become a round of pleasure. The reflection of this indefinite idea of what was coming, when the possibilities of mechanical engineering were exhausted, is seen in the books and plays written during the past half century, in which the civilization of the future is foreshadowed in caricature. But we are suddenly confronted by the fact that we are nearer the maximum of economy than we thought, and that it is possible to reduce the present cost of manufacturing by a very small margin only, before we shall have reached the point when economy will cease and the cost begin to increase again. We find that it is often cheaper to waste a little than to render waste impossible, and that it would cost more than we should gain to save the percentage of power which is now wasted. This is true of both steam and water power, and henceforth our progress must be slow unless new elements are introduced. We can now make boilers that will evaporate as much as 10 lbs. of water to the pound of coal consumed under them,

When it is attempted to produce a greater economy than this, the interest upon the increased cost of the boiler amounts to more than the value of the coal saved. The consumption of the very best engines now manufactured reaches two pounds of coal per horse power per hour, while three pounds would be a more common figure with even the finest engines in the market. It might not be far out of the way to say that the general average would not be below six pounds of coal per horse-power per hour. Estimating the cost of a hundred horse-power per year produced by the consumption of three pounds coal per hour, as stated above, we should have a consumption of 450 tons of coal, worth say \$2250. Labor would amount to at least \$1400, while interest, including a sinking fund with which to replace the machinery when worn out, would amount to \$1000, which makes a total of some \$4650 as the cost of 100 horse-power for 10 hours per day during 300 working days, or one year. Except in the rarest cases, where there are exceptional engines of large power, it is not probable that the power costs as little as we have estimated, while in most instances, where small engines are used, the rate would be very much exceeded.

That much will be gained, in the way of cheapening production, from the gradual introduction of new and economical engines to replace those now in use, and which must wear out sooner or later, is evident. Manufacturers have discovered the benefit of using the best engines, and are disposed to look with more care after their coal consumption than they formerly considered necessary. But when the average duty of steam engines shall approximate that of the best now in use, the maximum of economy will have been reached, so far as steam is concerned. Where dams and sluice ways are already constructed, and the quantity of water is practically unlimited, a horsepower can be obtained for about half what it would cost if produced by a steam engine—at least it can be rented for that, to which must be added the cost of putting in a wheel, the interest on the same, and the wear and tear. With steam, however, the figures given are near the point below which no possible reduction can be made. The famous Perkins engines already utilize about seventy-five per cent. of the theoretical power of coal. Here, then, we have a standpoint from which to judge past, present and future progress. In economy, the progress of the last 50 years has been from the production of one horsepower with five or six pounds of coal per hour, to the production of the same power with one pound per hour. Beyond this we can make but little progress, unless it be in some new and hitherto unknown direction. It is, of course, impossible to say what new discoveries may be made, but with our present knowledge of nature's laws, we are justified in believing that we are not on the eve of a mechanical revolution, and that hereafter it will be impossible to cheapen steam power materially, unless we can reduce the cost of coal by devising cheaper methods of mining and transporting it.

That there will be a rapid and sustained industrial progress during the next century is probable, but it will be a progress in the direction of economy in little things. Chemistry is showing us how to utilize our former waste products, inventive talent is constantly employed in devising means of economizing labor, and the arts and sciences are all contributing to progress in numberless ways; but no discovery has yet been made which affords a basis for a reasonable hope that we shall have motive power at a cost very much below the cheapest price at which it is now obtainable.

The National Association of Stove Manufacturers.

Elsewhere in this issue will be found a very full report of the meetings of the National Association of Stove Manufacturers in Albany, on Wednesday and Thursday last. As will be seen from our report, the association decided that the price of stoves for the ensuing year could not be reduced more than ten dollars per ton from the minimum scale adopted at the Pittsburgh meeting in February 1873. This scale was as follows:

Common Stoves	T _{1/2} C.
Medium Class Stoves	5C.
First Class Stoves	9C.
Gold Plates	9C.

In the judgment of the Association, formed after much debate, the reduction of \$10 per ton is all that can safely be made at this time, without wiping out the founders' profits. The only reduction in the cost of making stoves is in the item of pig iron, and \$10 per ton gives the consumer all the advantage which cheaper iron would have given the manufacturer had prices been maintained on the Pittsburgh basis. The meeting was large and harmonious, and insures the permanence of the

association—a fact upon which the trade is to be congratulated.

Among the interesting features of the meeting was the reading of papers by Mr. G. F. Filley, on the comparative cost and profit of light and heavy stoves, and by Mr. Wm. Keppel, on the causes of cracks in iron castings. The former of these valuable essays we give in this issue; the latter will be given as soon as the work of engraving the plates is completed.

The Centennial Report.

A report has been agreed upon by the Executive Committee of the Centennial Commission, which has been sent to Gen. Hawley, President of the Commission, now in Washington. It begins with the report made in February, 1873, by the Commission to the Senate and House of Representatives, and then gives an account of the work which has been done since, namely, the change of organization, making the Hon. Alfred T. Goshorn, of Ohio, the executive head, with the title of Director-General; the organization of a foreign department, presided over by Henry D. J. Pratt, formerly in the State Department at Washington, whose duty it is to open communication with foreign exhibitors; and the appointment of Henry Pettit, of the engineering service of the Pennsylvania Railroad, to take charge of the engineering department. The plans for the main pavilion or exhibition building by Vaux & Radford, of New York, together with those for the memorial building to be constructed by the city and State, by Collins & Autenreith, of Philadelphia, were also reported. A full account of the work done in the office since the last report is given, and in conclusion the report urges on Congress the necessity of taking immediate action on the measures that are intended to further the interests of the Commission.

The committee also passed resolutions in the nature of a memorial to the President of the United States, in which they say that everything that has been done has been effectually done, and they consider themselves now in advance, so far as preparation is concerned, of any exhibition that has ever been held. They conclude by saying that if Congress comes to their assistance immediately there will be no difficulty in making the Exhibition all that is promised by its most sanguine friends.

A Scientific Section of the Iron and Steel Association Proposed.

It is gratifying to learn that the officers of the American Iron and Steel Association realize the importance of doing something to promote scientific study and investigation among the ironmasters of the United States, and to create an American literature of metallurgy which shall reflect, correctly and completely, the rapid and sustained progress of our great metallurgical industries. To promote this progress by the investigation and discussion of subjects connected with the chemistry and metallurgy of iron and steel was one of the objects of the Association, but other work of more immediate importance has monopolized the attention of its members. It cannot longer be neglected, however. The Iron and Steel Association is now the one representative association of American iron masters. It is strong in numbers, strong in wealth, and strong in influence, and upon it devolves the duty of stimulating progress by promoting scientific study and experiment, as well as the duty of guarding our iron and steel industries from the attacks of those who would sacrifice home industry in the interest of foreign trade. It has long been a source of mortification that we have, in this country, no scientific association organized for the discussion of subjects connected with the metallurgy of iron and steel. The American Institute of Mining Engineers has a large and influential membership from the iron trades, but it does not call out the full and free discussion that is so much needed, for the reason that its meetings are largely attended by representatives of other professions who feel no especial interest in iron, and whose contributions to its proceedings relate chiefly to mining and the precious metals. But notwithstanding the fact that it represents half a dozen or more distinct branches of mining and metal working, it has called out the best contributions which have been made to the current literature of iron metallurgy during the past two years—a fact which warrants the belief that an association composed wholly of those interested in the science and technology of iron manufacture would do much to awaken a new and active interest in a department of study and investigation which have been too generally neglected by American ironmasters.

The project now under favorable consideration in the Executive Committee of the American Iron and Steel Association is, we believe, to invite a number of gentle-

men known to be deeply interested in iron metallurgy to organize a scientific section which, when organized, shall form a part of the association. It will be governed by its own by-laws, and will meet quarterly wherever the largest attendance can be secured, and where there are interesting iron works or mines to be visited. The section will be self-supporting, and its membership will be exempt from assessment for purposes connected with the work of the association proper. This, we understand, is the general plan upon which it is proposed to organize the Section, and it could not be better. By meeting in different parts of the country, a greater and more general interest will be created in the work of the Section than if it should meet regularly in New York or Philadelphia. The proceedings will be published in some permanent form, accessible in all the public libraries to students of metallurgy, and will be valuable additions to our limited American literature of iron and steel. To make the organization of the Section complete, it should have a Foreign Secretary to attend to duties similar to those so ably and intelligently performed by Mr. David Forbes, of the British Iron and Steel Institute, and standing committees to investigate and report upon all novelties, improvements and discoveries which may possess general interest and importance. With the addition of such a Section, the American Iron and Steel Association would stand without a rival among the greatest trade associations of the world, and its influence in promoting the progress of our iron and steel industries would be great and permanent. If we are rightly informed, the addition of a Scientific Section has been decided upon by the officers of the association, and we hope the work of organizing it will be undertaken without delay. We can promise the active co-operation of many gentlemen of high scientific attainments and national reputations, and we think there will be but little difficulty in securing a large and valuable membership in a short time. Certainly, such a society is needed in this country, and if organized under the auspices of the American Iron and Steel Association, it cannot fail to enjoy the fullest confidence of iron masters and metallurgists in all parts of the country.

The Proposed Railroad Tunnel from Dover to Calais.

For several years the proposition to build a tunnel under the twenty-six miles of sea that divides England from France at the nearest points, has been occasionally brought forward for discussion; and the surveys of French and English engineers have almost demonstrated the practicability of the project. But, hitherto, the financial prospects of the enterprise have been less encouraging than the probability of overcoming the engineering difficulties. The English and French engineers engaged to make surveys and report on the subject, put forward a plan in 1867, for the construction of a tunnel 34,400 metres long, connected to the network of railway on either side of the English Channel by underground galleries about 10,000 metres long. Applications were made to both the French and English governments for funds to enable the projectors to construct submarine sections on either side of the channel as an experiment, but the demand was not then favorably entertained, and the breaking out of the war between France and Germany put a stop to any further action at that time. Since then a company of English and French capitalists has been formed, who propose without government aid to

The Stove Founders' Convention.

The Semi-Annual Meeting at Albany.

The National Association of Stove Manufacturers assembled for its usual winter convention at Horticultural Hall, Albany, on Wednesday last. The attendance was unusually large, fully one hundred members being present, several of whom represented two or more foundries. It was in all respects a successful meeting, and its action insures the permanence of the association, and disappoines the expectations of all who looked for its disruption.

The meeting was called to order by Mr. Jno. S. Perry, of Albany, president, who proceeded to deliver an address of much interest and value.

ADDRESS OF MR. PERRY.

Gentlemen of the Association.—It is now two hundred and sixty-five years since, in the gray dawn of an autumn morning, a gang of red men stood at the foot of the hill on which this city is built, watching with curious eyes a Dutch galleon, propelled by huge sweeps, which was silently nearing the shore. *

Years rolled on. The red man smokes his pipe in the "happy hunting-ground" of the Great Spirit. The screaming of the eagle in the mountain tops gives place to the voice of the dove in the belfry of the church. The name of Orange is succeeded by that of Albany. The wooden covering of the hill is usurped by the quaint gables and tiled roofs of the Hollander, and these in turn are supplanted by the elegant residences of modern times. But through all of these changes the hospitality which characterized the aboriginal inhabitants of our Dutch city has remained the same, and to-day, with open doors, we extend to you as hearty a greeting as was given two centuries and a half ago to Hendrick Hudson and his brave followers.

We have met here to-day to discuss in a friendly spirit the events of the past year, so far as they have had a bearing upon our business, and to discover, if it may be, that course for our future action which shall secure to us the greatest prosperity. To aid us in this attempt we must dismiss all sectional prejudices, and all those feelings which naturally arise from business strife and competition.

We are, I trust, naturally inspired by mutual good will, as well as by a desire for the prosperity of every portion of our common country. We meet here upon even ground. Neither by nature, custom or law, have any individuals or classes special claims upon the business of any particular territory. It is theirs only when obtained in a legitimate way, that is, open to the rest of the world. This perfect freedom in trade must be acknowledged and accepted as a fundamental principle, which no human power can change.

We must also frankly accept the fact that while our general interests are similar, if indeed not identical, there is an antagonism between our special and personal interests which cannot be overcome. Starting thus upon this basis, which is laid on the very foundation of things, it becomes us, first, carefully to inquire what course of action shall permanently promote our own individual interests, as well as those of the whole trade; and, secondly, what uniform plan can be adopted and carried successfully into practice under existing circumstances.

I will submit for your consideration a few plain propositions:

1st. The primal object of manufacturing and selling stoves is:

a. To secure an honorable living; and

b. To produce such improved articles of utility or elegance as shall tend to promote civilization and human comfort.

2d. The occupations in which we spend the greater portions of our lives should be so conducted as to best promote our individual happiness, so far as that may be consistent with the rights of others.

3d. The cost of our products is, in the main, beyond our control, although it may be somewhat modified by circumstances or industry and skill.

4th. Whatever may be our views as to the details of this cost, the exact amount will be shown by the balance sheet at the end of the year.

5th. To realize the success so greatly desired and so justly our due, an ample margin of our prices above this cost must be secured, or ruin is only a question of time, even to the strongest.

And, sixthly, Such a disaster to any large manufacturing interest would be a public calamity, since, when each individual is reasonably prosperous, the whole community is benefited.

These propositions being admitted, our course of action would appear to be plain. But unfortunately another element exists which we cannot control, viz.: the want of unity of thought and action in the trade at large. We have, during the past two years, made strenuous efforts to overcome this impediment, and although only partially successful, enough has been accomplished to give us encouragement for further exertions. During most of this time a body of men, forming three-quarters of the trade, have faithfully tried the experiment of association—have made a fair approach to a millennium and realized to some extent its blessings. We have thus experienced a prosperity and a satisfaction in conducting our business to which we had for some previous years been strangers, and which we shall not be likely to see repeated under any other system.

We have seen that under ordinary circumstances it is possible for 163 independent manufacturers of an important trade to act in harmony and substantially fulfill their mutual pledges, and thus, too, while the remaining 55 members of the same trade have not only refused to cooperate, but, in some cases at least, have availed themselves of the situation to obtain the temporary advantage which such a course seemed to promise.

The reports from the leading markets are uniformly to the effect that the business was satisfactory, both in amount and in prices, until the time of the panic. * * * But is it not true that all branches of trade have suffered from the whirlwind which engulfed so many strong houses into ruin? I venture to say that in no department, either of mechanical or commercial industry, has there been less suffering than in the one which we represent; we may confidently predict that in the work of recuperation it will be in the front rank.

The low prices at which common forge iron were quoted during the autumn and early winter, will give the public an impression that stoves will bear a very large reduction the coming season. Nothing can be further from the truth. The cost will be just \$10 per ton less than last year. This allows a reduction of \$1 upon a stove weighing 200 pounds. The minimum prices established a year ago were as follows: 7½c., 8c., and 9c., with a reduction of half a cent per pound, which is the amount that we shall save the present year in the cost. The minimum prices should be 6½c., 7½c., and 8½c. These prices must be maintained if we would have the results of 1874 equal to those of 1873. That even these latter figures were unsatisfactory in many cases, I am assured by some firms who make desirable stoves, and are willing to obtain good prices for them.

It must be admitted, however, that our organization, imperfect as it is, has been of great advantage not only to our own membership, but to those who have neither given us their influence nor aid. Our sales were generally satisfactory in amount, and the prices well maintained up to the time of the terrible revolution in September last. An exceptional state of things existed after that time, which could not have been foreseen. Iron fell rapidly in price, and the borrowing of money was impossible. Encroachments were pressing, and self-preservation compelled many to disgress from their accustomed paths. Thus the prices of the more common qualities of stoves became somewhat unsettled toward the close of the year. But it

has been generally remarked that they were better maintained than might have been expected under the trying circumstances, and this was in a great measure due to the influence of the association. * * * * *

I think we shall all agree upon one point, viz.: *That the Association must be sustained.* Great benefits have already resulted from our frequent meetings, not only in the discussion of matters in which we have a common interest, but also in our social and personal relations. Asperities have been softened, friendship and good feeling promoted, information of common interest has been disseminated, and movements for the general good made with a power which individual effort could not command. * * * * *

It has also been said that the trade of the West belongs to the Western manufacturers, and that the East has no right to seek for it. All we might fit be said that the waters of the Hudson have no right to find the sea. They will, nevertheless, continue thus to flow as long as the face of the country remains unchanged. And so will the East continue to seek a market in the West, until driven out by better goods or lower prices. This is in accordance with an invariable law of trade, nor can human power alter it. The situation must, therefore, be accepted. New England and Pennsylvania will come to New York, and the latter will return the compliment. The East will seek a market in the West, while the latter can repay it in the same coin. All this is beyond the province or the power of our association. If it be true, as alleged, that Eastern competition causes a serious injury to Western manufacturers, then so much the more do the latter need the protection of established prices. In the one case they have the competition with reasonable profits, and in the other with disastrous losses. Which, I ask, is the least of the two evils?

It is held by some that the association has injured the trade by bringing into existence and fostering new foundries until the trade is overdone. I am not prepared to say that the trade is not overdone, but I believe it to be true that there are a less number of stove manufacturers in business to-day than was reported at the time of our organization, and I question whether the number will be increased at present, though the annual product may be larger.

But, granting that there has been a moderate increase during the past two years, has not the progress of our country in wealth and population more than equalled it? The population in 1870, according to the census, was 38,555,983. With the same ratio of increase as during the last forty years, we shall have, in 1875, a population of 43,429,459, or about a million more families to be supplied with stoves than in 1870.

But suppose this estimate shall not be reached, and the number shall only reach half a million,

this will give us a total of 8,211,197 families

which sooner or later are to be supplied with stoves—a number large enough to set at rest any idle fear with reference to the future.

It is estimated that our annual increase in wealth is not less than one thousand millions. The exact figures from 1850 to 1860 are \$97,092,000; from 1860 to 1870, \$1,373,601,000; and the average for the twenty years, \$1,135,347,000. Our annual industrial products, which include those of agriculture, manufacture and mining, were reported in 1870 at \$6,525,095,512. As the increase in manufactures during the previous decade was 108 per cent., I think the following will not be an unreasonable estimate for the next twenty-five years:

1880.....	\$ 9,525,000,000
1890.....	13,000,000,000
1900.....	17,000,000,000

In this proportion of increase we have at this time a total annual product of \$7,725,057,757.

Bearing in mind these figures, let us consider for a moment the possibilities of our country when the density of our population shall be equal to that of Great Britain.

Instead of forty-three millions we shall number 825 millions, and in the same comparison with Belgium we shall reach the enormous figure of 1333 millions. But, without looking into distant time, we have in the present and in the immediate future a sufficient population to allay any fears that may arise from a moderate increase in our production.

In view of the amount of our present industries and the estimated increase during the several decades named, I ask you to consider for a moment how illogical are the propositions of certain wise men that the volume of our circulation shall never be increased beyond seven hundred and fifty millions, and where, I ask you, is the specific basis to be found in a volume of the year 1900 for paper circulation proportionate to seventeen billions of annual productions? A specific basis for our circulating medium in itself is superb—but in practice it is a fallacy. When the public do not want to spend the banks pay it; but when they call for it there is none to be had. It costs me \$1.12, if you please, to pay a foreign debt upon a dollar. With the present amount of circulation, I can better afford to pay \$1.50 in settlement of the debt than to have this volume reduced to a point compatible with specific payments.

At this particular time, when the country has but partially recovered from the paralyzing effect of a great financial crisis, it is not unlikely that the stocks of stoves on hand, and the facilities for production, may be in excess of the demand. The same, however, may be said of most other departments of industry. Those who hold large stocks will manufacture less than usual, and thus the supply and demand will become equalized by the operation of natural laws. Nor is it unlikely that the volume of business during the present year will be reduced. Such years are incident to all departments of business. But taking one year with another for five, ten, or twenty years, I see no reason to doubt that satisfactory returns will be realized if due regard is paid to the fundamental laws of trade.

The reports from the leading markets are uniformly to the effect that the business was satisfactory, both in amount and in prices, until the time of the panic. * * * But is it not true that all branches of trade have suffered from the whirlwind which engulfed so many strong houses into ruin? I venture to say that in no department, either of mechanical or commercial industry, has there been less suffering than in the one which we represent; we may confidently predict that in the work of recuperation it will be in the front rank.

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The minimum prices should be 6½c., 7½c., and 8½c. These prices must be maintained if we would have the results of 1874 equal to those of 1873.

That even these latter figures were unsatisfactory in many cases, I am assured by some firms who make desirable stoves, and are willing to obtain good prices for them.

A further reduction of \$10, or in all, \$20 per ton, might leave such firms with the balance on the wrong side. On a product of 3000 tons such a reduction from the net profits would be \$30,000. Are we prepared for this? Would not such a proportionate reduction from the profits of last year absorb every dollar which our

books now show? This is a vital question, and should be deeply pondered before it is too late. * * * * *

In my estimate of cost of ordinary stoves, submitted in March, 1872, I showed the amount, with iron at \$40 per ton, to be.....\$120 00 From which deduct for present difference in iron..... 5 00

Showing the present cost to be..... \$115 00 Add \$20 per ton for profits..... 20 00

\$135 00

or 6½ cents per pound; and this is the rate which I think we should now only adopt, but also strive to maintain, if we would be happy when our balance sheets are made out at the end of the year. Iron may now be fairly quoted at \$35. The future will depend upon supply and demand. Of the low grades of iron there is a surplus; but this is not the case with such qualities as are required for stove plates. At our last annual meeting, I placed the product of our furnaces for the year 1873 at 2,000,000 tons. Some estimates were made for three millions and over. The returns show the actual product of 2,406,637 tons, or a falling off from the previous year of 130,211 tons. The capacity of our furnaces, if all were run continuously, is placed at 4,371,277 tons, and, therefore, it would appear that any material advance in price would soon create a surplus. Between 200 and 300 furnaces are now reported out of blast, waiting for favorable prospects to resume. It is stated in the last report made by the Pig Iron Association that the cost in December, 1873, at the furnaces, was \$38.97. If this be a fair criterion for the present year, the profit at \$35 for Nos. 1 and considerably lower prices for Nos. 2 and 3, does not show a margin which admits of much reduction.

The stock of pig iron in the North of England and Scotland on the 31st December was

35,000 tons less than the previous year, and the average price of sixteen shipping brands twenty-two shillings and sixpence greater.

Coal is more abundant in Great Britain, and is probably the cause of the price difference.

It is probable that the price of iron there will

be a little higher than in America, but the

difference will not be great, and the price of

iron in America will be lower than in Great

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done more to maintain prices, at greater cost to themselves, than Messrs. Jewett & Root, of Buffalo, and that Mr. Jewett's views should be considered.

Mr. Jewett responded, acknowledging the compliment.

Mr. Teft thought that different classes of customers should have different rates.

Mr. Sard believed the association had been of great benefit to the trade during the past year. Did not believe the price of stoves could be reduced in proportion to the decline in pig iron without wiping out profits. He thought that every member of the association should sell his stoves at whatever price satisfied him, but that a minimum should be agreed upon as a starting point, although makers should not be obliged to charge it if they could not get it.

Mr. Teft reported what the committee had done to secure the favorable consideration in Congress of the bill to secure the right of property in patterns of metal castings, and asked that an appropriation be made for the expenses of the committee.

A motion was offered and carried that each member be called upon to pay \$10 into the treasury, and that the president assess the members for such amounts as might be needed.

Mr. Pope, of New York, was introduced, but declined to address the meeting, which then adjourned to meet at 10 A. M. the next day.

THE ENTERTAINMENT AT TROY.

At 2:30 P. M. the members and guests of the association assembled at the depot to enter the special train for Troy. Arriving at the club house, the association was welcomed by Mr. Eddy, on behalf of the Troy founders, and Mr. Perry responded for the visitors. An elegant collation was then served, and at 5:30 the company returned to Albany.

MR. AND MRS. JOHN S. PERRY "AT HOME."

In the evening the company again assembled as the guests of Mr. and Mrs. John S. Perry, at their beautiful home on Washington avenue. A number of ladies were present, and added to the enjoyment of the evening, which passed quickly. The company dispersed about eleven o'clock with pleasant memories of the generous hospitality of their hosts.

THURSDAY'S MEETING.

The meeting was called to order by the chair, and reports of committees were called for.

The committee on prices reported as follows:

From our experience in the results of the past year's business, and fully considering the present and probable cost of the future productions, your committee beg leave to report: That while we distinctly disclaim any intention of combining for the purpose of dictating or establishing a fixed tariff of prices, we believe that a fair and uniform price for our products will favor the interests of all manufacturers, dealers, and consumers; and after a careful review of the situation in all its bearings, we recommend the adoption of the following resolution: *Resolved*, That in the judgment of this convention, in view of the facts above stated, the reduction in the price of stoves, hollow-ware, and castings should not be more than \$10 per ton below the price recommended at our meeting in Pittsburgh in 1873.

Mr. Jewett moved to adopt the resolution.

The chair said that discussion was desirable before the vote was taken.

Mr. Chamberlain did not think discussion would change the sentiment of the meeting, which, in his judgment, was in favor of the resolution.

Mr. Rathbone considered discussion eminently desirable, and hoped there would be a full expression of opinion. The committee had found that the only reduction in the cost of making stoves was in the single item of iron, and he thought \$10 per ton was all that could safely be taken off.

Mr. Hill said the committee felt there was a diversity of opinion existing in the convention, but that they had reported to the best of their judgment. He thought that too many founders had sold stoves for less than actual cost during the past year, and that enough allowance had not been made for the pattern account and other incidental items. Founders must meet competition, of course, and must regulate their prices according to the circumstances in which they find themselves placed.

Mr. Gibbs did not consider a recommendation strong enough. He thought the action of the association imposed a moral obligation upon its members—otherwise, why agree upon a price at all? He approved of the association, but feared it would be of no benefit if it did not absolutely fix a minimum and exact a pledge that stoves should not be sold for less.

Mr. Fuller said the committee only wished to recommend a basis. If manufacturers could not get scale prices, they would, of course, have to take less or lose their business.

Mr. Robertson called to mind the slaughtering of prices a few years ago, and considered that the Association had been of great benefit in saving the trade from a similar course in 1873.

Mr. Gibbs repeated his opinion that the members ought to consider themselves morally bound to maintain whatever price might be agreed upon.

Mr. Chamberlain believed that the recommendation of the committee would be accepted with confidence by the trade, and that its effect would be to stiffen the market.

Mr. Merriam thought the report sensible and judicious; was ready to vote for it, and would pledge himself not to sell his goods for less than they cost him. His remarks were very witty, and caused much amusement.

Mr. Gibbs was ready to vote for it also, but thought that those who voted with him should consider themselves bound to stand up to the price adopted.

A vote was then taken, and the resolution reported by the committee was adopted.

The question of the place of the June meeting was then discussed. Representatives of Boston, Cleveland, St. Louis and the Niagara district took part, but a vote settled the question in favor of Long Branch. Mr. Eddy called for a reading of the bill securing the property right in metal castings, introduced by Mr.

Sumner in the U. S. Senate. The bill, which was published in *The Iron Age* of February 5th, was read by the secretary, and briefly discussed by Mr. Pratt.

Mr. Perry laid before the meeting a letter from Mr. Henry Carey Baird, of Philadelphia, urging on the attention of the founders the importance of securing the introduction of American stoves into the English market.

The letter was received with approval, but it did not call for any definite action.

Mr. Olhaber offered the following:

Whereas, The centennial anniversary of American independence is to be celebrated by a grand industrial exhibition to be appropriately held in Philadelphia; and

Whereas, The stove manufacturers of the United States, as represented by this association, desire to promote the success of the Centennial Exhibition, and to enter the products of their foundries in competition with each other and all the world; and

Resolved, That this association apply for space as the Representative National Association of Stove Manufacturers of the United States, and, as an association, undertake the work of organizing a grand national exhibition of stoves and heating apparatus.

Resolved, That a committee of five be appointed to confer with the Director General on behalf of the association, and make application for space for such an exhibit; and that said committee be authorized to promise, on behalf of the association, that the space granted shall be so apportioned among intending exhibitors, members of this association, as to insure a full and attractive exhibit of American stoves and heaters, which shall creditably represent the progress and present development of the art of stove founding in the United States; said committee to take such further action as may seem expedient, and report the same at the next meeting.

Adopted.

By invitation of the Chair, Mr. Bayles, Editor of *The Iron Age*, addressed the meeting on the subject of the Centennial, as follows:

Mr. Chairman and Gentlemen:

In accepting the invitation with which I am honored to address this Association on the subject of the industrial exhibition with which we are appropriately celebrating the Centennial Anniversary of American independence, I can scarcely hope to bring to your notice any facts with which you have not already been made more or less intimately acquainted through the public prints. The Centennial Commission have done no work in secret, and the press has rather anticipated than concealed the movements of those to whom the management of the undertaking has been committed. Of the present status of the Centennial I need only say that, while much valuable time has been unfortunately lost on account of the disarrangement of the plans of the Board of Finance, by the late panic, the pledge of national, State and municipal aid to a sufficient amount, including the three and a half millions, (in round numbers) already subscribed or collected, have happily relieved the commissioners of any anxiety on the score of money. By acts of Congress and executive proclamation, the faith of the nation has been pledged to make the Centennial a success; and I do not doubt that the great arcades of glass and iron in which are to be gathered the evidences of our marvelous industrial progress, side by side with the most useful, most beautiful and most interesting productions of nations older and younger than our own, will rise in good time above the yet unbroken lawns of Prospect Park, by the aid of no other power than the potent magic of American enterprise. I speak from my own knowledge when I say that the great work of organizing the Centennial Exhibition has been entrusted to competent and honest hands, and that the interests of the nation will not suffer from mismanagement or neglect.

It is not my intention, gentlemen, to waste your valuable time in general talk about the Centennial, although the interest I feel in the enterprise is so great that I should count no time wasted that might be judiciously spent in discussing the immediate and prospective benefits that may reasonably be expected to result from it. But other and important business awaits your attention, and I shall be brief. To avoid discoursiveness, as well as to definitely limit the time I shall occupy, I have condensed what I shall have to say into a few pages of manuscript, which, with your permission, I will read:

The space in Prospect Park, West Philadelphia, appropriated to the Centennial exhibition, includes, altogether, 450 acres. The location is well chosen. Its elevated position will impart additional dignity and grandeur to the structures, while for convenience it cannot be surpassed. By means of short branch lines connecting with the Pennsylvania Railway, articles for exhibition can be brought by rail within the grounds from any point in the United States, without the necessity of transhipment, if frail or bulky. The buildings already decided upon, and not including such as may be erected by private enterprise to contain exhibits of a special class, are as follows:

The Machinery Hall.

The Agricultural Hall.

The Conservatory.

The Art Gallery—a permanent building to remain as a memorial of the exhibition.

The Grand Pavilion, or Main Exhibition hall.

Of the last named building only will I have time to speak, and that briefly; but as it will contain the exhibition proper, a few facts concerning it, sent me a few days ago from the office of the Commission, in Philadelphia, cannot fail to be of interest.

It is designed as a parallelogram having the following dimensions:

Length, including porches, 1876 feet.

Breadth, 812½ feet.

Area of floor for exhibition purposes, 26 acres.

Area of galleries 3 acres.

Area of offices, restaurants, &c., 1½ acres.

Total area available for exhibition purposes, 30½ acres.

The building is composed of twenty one pavilions, seven in length and three in depth, each pavilion being 240 ft. 10 in. square. The corners of the squares will be cut off so as to form octagonal open courts, of which there will be twelve, besides the 20 semi-octagons on the exterior. The pavilions will be covered with curved roofs, supported on arched ribs or trusses springing from the ground line at the angles and faces of the octagons. These ribs are 25 feet 4 inches in span, intersecting in pairs at the summit of the arch. Besides these there will be arched ribs, extending from side to side of the squares, having spans of 173 feet 4 inches. The space between the floor and ceiling in these pavilions is 137 feet 8 inches; the height of the center pavilion will be much greater. The galleries will not interfere with the floor space, but will be arranged in the recesses formed by the projections of the gables, and communicate by stairs with the floor level. Their dimensions are 173 feet 4 inches in length and 50 feet in width.

The sides of the octagonal courts before

mentioned will be glazed to a height of 53 feet, and will have ornamental heads and decorations of galvanized iron. The gables and fronts will be glazed to the full height of the ceiling, and skylights provided in the roof, so that ample light will be secured with provision for preventing the direct rays of the sun from penetrating the building.

The interior of the building will be lined with suitable decorative material, colored, and finished to appropriate designs. The space between this lining and the galvanized covering being 11 feet, will act as a non-conductor, and assist in keeping the building cool during the hot summer months, means for ventilation being provided in the upper part of the roof.

The articles for exhibition will be divided into departments of classification, arranged in parallel or continuous belts, or zones, surrounding a central aisle of 60 feet in width, and divided in pairs by aisles of 15 feet in width, with transverse aisles of 30 feet and 16 feet in width.

The space allotted to each exhibiting nation will be a segment, or portion, of each belt, or zone, extending from the central aisle to the side of the building. This plan is similar to that of the Paris Exhibition of 1867, but arranged in the form of a parallelogram, instead of an ellipse.

It will thus be seen that the building, although composed of twenty-one separate pavilions, practically forms one vast hall 1669 feet long, 705 feet broad and 137 feet high, the courts merely acting as the columns which support an ordinary ceiling. Magnificent vistas are thus secured in all directions, and an area of 17½ acres will be visible from any central point of observation.

From this brief and unsatisfactory description but little idea can be gained of either the size or appearance of the buildings, but from a careful examination of the plans and perspective drawings, for an opportunity to examine which I am indebted to the Director General, Mr. Goshorn, I can say that it will be creditable to the nation, and compare more favorably with the exhibition buildings of Paris and Vienna. The other buildings will be in keeping with the one described, though not uniform with it. The permanent Memorial Hall will be a structure of great beauty, covering 1½ acres. The Machinery Hall will cover 10 acres and the Agricultural Hall 5 acres.

In its character the exhibition will be, in the broadest sense, national; the extent to which it will be international depends upon the action of other governments: but I have every warrant for the assertion that, should nothing happen in the meantime to provoke the hostility of the now friendly powers of Europe, it will be more truly an international exhibition than either Paris or Vienna. There is something magnificent in the spectacle of our young republic—a century ago a federation of detached and sparsely populated Colonies organized for purpose of defense against foreign oppression—celebrating the centennial anniversary of its birth as a nation with an exhibition of the arts of peace which will eclipse any the world has ever seen, that commands the attention alike of prince and peasant. It is an event for which the world was unprepared, but not one upon which the nations look with disfavor. They would see this young giant which challenges the world to a trial of strength and a comparison of skill. They would know more of this ambitious nation, born of strength which they have lost in the ceaseless outflowing trade of westward emigration—a nation which in a century has spread over a continent, transformed the wilderness in a garden, and planted cities where, within the memory of living men, grew primeval and unexplored forests. They would see what order and beauty has formed itself within the crucible of a politico-social system in which so many heterogeneous and seemingly antagonistic elements have mingled. The thought that, through the bloodless victories of peace, we are achieving an industrial and commercial independence, troubles them. They will come and bring with them their products and manufactures, their works of beauty and utility, that they may retain so rich a market for their wares, or, failing in that, learn if they can the secret of our great progress. I am prepared to say—and here I speak advisedly, for my information is gained from those lately returned from abroad—that more interest is felt throughout Europe to-day in the Centennial Exposition than is felt in this country five hundred miles from Philadelphia in any direction. The commissioners appointed by the governments of Europe and Asia will be composed of the most distinguished statesmen and savans of their respective countries. The governments of the German Empire, Belgium, the Netherlands, Mexico, Hayti, Ecuador and Brazil have already formally accepted the invitation of the President to participate in the exhibition: England, France, Austria, Italy, Russia, China, Japan and many countries of less extent and importance, will also take part as the work progresses to a successful conclusion. There is also reason to believe that we shall be called upon to welcome representatives of the royal families of England, Austria, Italy, Russia, Brazil, Japan and other European and Asiatic kingdoms. Of course, such visitors confer no honor by coming; the honor consists in a national greatness which commands respect, and a national progress which excites curiosity. But we may be sure that what royalty signifies its intention to graciously smile upon and bless with its sanctified and anointed presence, will not lack the more substantial and desirable patronage of foreign exhibitors and visitors with no other titles than those which have been won in commerce and industry—titles, let me say, which mean something, and which command honor even in republics. We have, I think, no reason to doubt that, as an international exhibition, our Centennial will be a success.

As an exhibition of our own industrial progress and commercial enterprise, of our young and vigorous civilization, of our great material achievements and of our genius in subjugating the forces of nature and harnessing its vast and imponderable couriers, I have no fear that the Centennial will do us discredit. Had all the space been granted for which application has already been made, there would even now be little room left for foreign exhibitors; and the difficulty will not be to fill the great pavilion, but to make room for all that will seek admission. Again let me remind you that I speak advisedly, and not at random. The preparation of this address has taken me twice to Philadelphia, that I might shape my opinions and verify my statements by consultation with the responsible officers of the Centennial Commission and I believe I have as much warrant for what I have said as is possible to have for any statement or prediction concerning events of the future. I do not think I have allowed my judgment of the conditions, present and prospective, affecting its probable success. I believe that the Centennial Exhibition—still a project, for only a flagstaff now marks the spot whereon the Grand Pavilion is to stand—will be worthy of the nation, and that great and permanent national benefits will result from it. I believe it will bring us into a more intimate acquaintance with the peoples of other countries; that it will promote our commercial welfare by opening new and profitable markets for our products and manufactures; that it will cement, by a concrete stronger even than the mingled "blood and iron" in which Prince Bismarck laid the foundations of the new German Empire, the bonds which link us with the peoples

of other lands; and that it will lead our young republic to a higher seat at the council board of the nations. Finally, gentlemen, I believe that it merits the liberal patronage of this Association, and I am authorized to say, on behalf of the Director General, with whom I have consulted regarding the appropriation of space for a grand exhibition of stoves and heating apparatus, that, should this Association undertake the work of organizing such a department, every favor which it is in the power of the Commissioners to grant will be extended to its representative committee.

Mr. William Keep then read a paper discussing the reasons for the cracking of stove plates in cooling. The paper was of great interest, and was illustrated with numerous well executed drawings, showing the arrangement of crystals in cast iron. We shall publish Mr. Keep's paper in full as soon as we can get the necessary engravings made.

Mr. Giles F. Filley read a paper on the comparative cost and profit of light and heavy stoves, which appears in another part of this issue. Mr. Filley's paper gave rise to much interesting discussion, and was unanimously pronounced of great interest and value. We invite the attention of our readers to it.

A motion was then called up that had been introduced at the June meeting, changing the time for the winter meeting, and discussion ensued which resulted in a vote, changing the time from the second Wednesday in February to the third Wednesday in January.

Mr. Ben. Pittman, of Cincinnati, was then introduced, and delivered a brief address on the subject of ornamentation as applied to iron castings. Mr. Pittman's remarks were illustrated by a number of well executed drawings, and some exquisite wood carvings from the Cincinnati School of Design for women. Mr. Olhaber called up a resolution left over from the June meeting abolishing the guarantee on stove plates from cracking.

Mr. W. W. Pasco, Editor of the *Stove and Tin Trade Journal*, was then introduced, and made a few remarks to the effect that Mr. Henry Carey Baird's views were erroneous, as no English market existed for American stoves.

Mr. Jewett moved a vote of thanks to the chair. Carried.

Mr. Chamberlain moved a vote of thanks to the Troy founders, and to Mr. Perry, for the social entertainment of the association. Carried.

The chair then announced the following as the committee to confer with the Director General of the Centennial Commission and ask for space on behalf of the association:

C. Olhaber, S. H. Ransom, J. L. Mott, W. H. Whitehead and G. F. Filley.

A vote of thanks to the press was then passed, and the association adjourned, to meet at Long Branch in June.

THE COMPARATIVE COST AND PROFIT OF LIGHT AND HEAVY STOVES.

BY MR. GILES F. FILLEY, OF ST. LOUIS.

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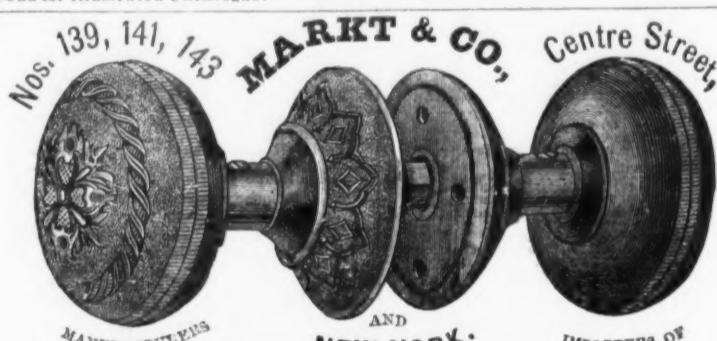
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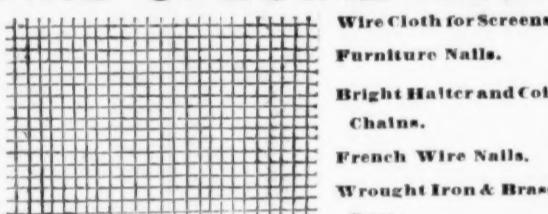
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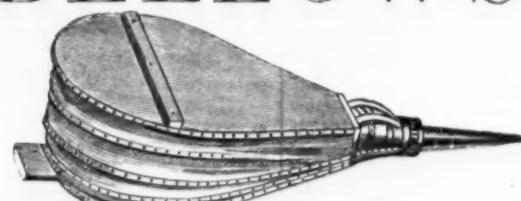
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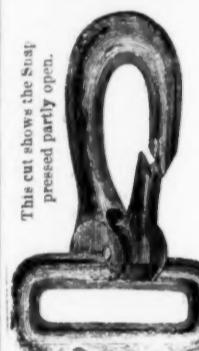
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a small or large Lawn, should examine
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the operator.

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Price of Monitor, (No. 0, 10 in. cut) \$15; No. 1, (14 in. cut) \$20.

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Trade Report.

Office of THE IRON AGE.

WEDNESDAY EVENING, Feb. 18, 1874.

The past week has witnessed but little revival of commercial activity, and the general dullness still pervades the financial markets. The failure of Congress to take any action on the subject of national finances, and the uncertainty of its arriving at any satisfactory solution of the grave problems before it, tends to weaken confidence in the immediate future and to inspire a caution which is unfavorable to a revival of business. Evidently, Congress is hopelessly muddled on the subject of the national finances, and the most that can be expected of it this session is that it will patch up some kind of a scheme which will afford a measure of present relief, and, perhaps, lead to an ultimate solution of the question of how the government can meet its enormous responsibilities without imposing a burdensome taxation. In Wall street there has been very little demand for money, even at the low rate of 4 or 5 per cent. on call. Loans on good collaterals have even been effected as low as 3 per cent., and the note shavers have been glad to get good commercial paper at 5 or 6 per cent.

The gold market has been strong, with an active speculation, which has carried the premium several points above the average of the past few weeks. The following shows the range of the premium:

	Highest.	Lowest.
Tuesday	112%	112%
Friday	112%	112%
Saturday	112%	112%
Monday	113%	112%
Tuesday	112%	112%
Wednesday	112%	112%

The stock market has been irregular, and the uneasy spirits of the Stock Exchange have tried very hard to get up a speculative excitement, with but limited success. On Tuesday considerable commotion was excited by the reading of two forged letters on "Change," one purporting to be a notice of an increase of the capital stock of the Western Union Telegraph Co. to \$50,000,000, and the other informing the Board that 100,000 new shares of Toledo, Wabash and Western were about to be issued. The forgeries were well executed, on the usual letter paper of the companies named, and considerable amount of their stock changed hands at a marked decline. They quickly recovered, however, when the bogus character of the letters was discovered, and should the perpetrators of the swindle be discovered it will probably go hard with them. We give below the highest and lowest of to-day's quotations of active shares:

The bond market has been strong, and prices have somewhat advanced. Railroad mortgages are inactive, but prices are well maintained. We quote below the closing prices of governments.

The following comparisons show the course of the foreign trade during the week:

	Imports.	Exports.
Total for week	\$8,719,339	\$11,364,268
Prev. reported	89,494,992	42,328,109
	33,575,239	

Included in the imports of general merchandise for the week are:

Quant. Value	
Anvils	50 935
B. & S. goods	18 2,271
Chains and anchors	151 4,448
Copper	4,391
Catifiers	105 40,235
Guns	6 1,672
Hardwicks	39 15,726
Iron bars, tons	1,442 43,239
Iron sheet, tons	49 5,538
R. & R. bars	5,410 90,310
Iron cotton ties	911 3,575
Iron, other, tons	213 16,028
Lead, pigs	6,912 41,963
Metal goods	149 20,500
Nails	24 470
Oil metal	19 12,038
Pew. caps	3,647
Pins	10 2,162
Stock	1,275 13,180
Silverware	2 343
Tin, boxes	3,722 307,203
Tin, slabs	140,268 36,614
Wire	26 6,418
Zinc	16,529 1,367

EXPORTS EXCLUSIVE OF SPECIE.

Since Jan. 1.....\$46,814,331 \$33,692,477 \$42,446,948

Included in the imports of general merchandise for the week are:

Quant. Value	
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Tin, slabs	140,268 36,614
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EXPORTS OF SPECIE.

Total since January 1, 1874.....\$4,344,957

The bank statement shows a decrease in the total reserve of \$1,714,300, caused by the excess of the loss in the specie over the gain in legal tender notes. The total liabilities have decreased \$2,200,300. The banks now hold, in what is reckoned as lawful money, \$23,917,725 above 25 per cent. of their total liabilities. There has been a pause in bank credit inflation, there being an increase in loans compared with last week of only \$939,900. The legal tender strength of the banks is greater than last week. The following is a comparison of the bank figures for the past two weeks:

Feb. 7.	Feb. 14.	Differences.
Loans....	\$27,237,100	\$28,217,000 Inc. \$70,900
Specie	33,220,700	30,687,200 Dec. 2,532,500
L. & T.	50,052,900	50,872,700 Inc. \$19,200
Deposits	239,958,800	239,770,700 Dec. 288,100
Circulation	26,993,800	26,995,600 Dec. \$400

Government bonds closed as follows:

Bid.	Asked
U. S. Currency 6%	116%
U. S. 6 1/2%, reg.	120%
U. S. 1881, con.	120%
U. S. 1865 5-20 reg.	121%
U. S. 5-24 1862, con.	118%
U. S. 5-20 1864, con.	120%
U. S. 5-24 1865, con.	121%
U. S. 5-24 1867, con.	119%
U. S. 5-24 1868, con.	120%
U. S. 5-24 1869, con.	119%
U. S. 5-24 1870, con.	120%
U. S. 5-24 1871, con.	119%
U. S. 5-24 1872, con.	120%
U. S. 5-24 1873, con.	119%
U. S. 5-24 1874, con.	120%
U. S. 5-24 1875, con.	119%
U. S. 5-24 1876, con.	120%
U. S. 5-24 1877, con.	119%
U. S. 5-24 1878, con.	120%
U. S. 5-24 1879, con.	119%
U. S. 5-24 1880, con.	120%
U. S. 5-24 1881, con.	119%
U. S. 5-24 1882, con.	120%

The following were the highest and lowest prices of stocks to-day:

Highest.	Lowest.
N. Y. C. & Hudson's Consolidated	104%
Lake Shore	82%

Brock Island	107%	107%
New Jersey Central	107%	107%
Del. Lack. and Western	111%	111%
Wabash	51%	50%
Harlem	134%	132
Western Union Telegraph	16%	75
Atlantic & Pacific Telegraph	18%	75
Northeastern	59%	58%
Northwestern Preferred	12%	75%
Milwaukee & St. Paul pref.	47%	46%
Milwaukee & St. Paul pref.	73%	73%
Pacific Mail	42%	42%
Erie	48%	48%
Ohio & Mississippi	33%	32%
Union Pacific	25%	35%
C. C. Ind. Central	32%	29%
Atlantic & Pacific Preferred	20%	31%
Hannibal and St. Joseph	41%	41%
Consolidation Coal	49%	48%

GENERAL HARDWARE.

Trade is generally reported as good, but there are few buyers here, and the bulk of the orders received are by mail. Travelers are, we believe, generally doing well, some of them reporting this as the best trip they ever made.

James M. Coppernoll, for many years connected with the John Russell Mfg. Co., and for the past two years with Landers, Farris & Clark, died after a brief illness, at his residence in Brooklyn, E. D., on the morning of the 17th instant, aged 57 years. Few men in the trade were more widely or favorably known. He will long be remembered by those who had intercourse with him as an earnest, straight-forward, consistent Christian man. The Brooklyn Times, published in the district in which he lived, closes a feeling tribute to his memory with the following truthful paragraph:

"Mr. Coppernoll's death is a loss to the entire community, whose best interests, political, moral, philanthropic, reformatory and religious, he strove to the utmost of his ability to promote. A great-hearted, high-minded, well-balanced, strong man has fallen, leaving a legacy in his example worth much to all who shall know how to profit by its use."

The funeral will take place at 2 o'clock on Thursday afternoon, at the Bedford Avenue Reformed Church, corner of Bedford Avenue and Clymer street, Brooklyn, E. D.

The prices of Brass and Silver Capped Screws have been reduced as follows:

Flat Head Brass Capped	dis. 50 & 10%
Round	dis. 35 & 10%
Flat Head, Silver	dis. 30 & 10%
Round Head, Silver	dis. 30 & 10%

The Hart, Bliven & Mead Mfg. Co. have issued an appendix to their catalogue of last year, containing a large variety of new goods, principally in the line of Builders' and Stationers' Hardware. The whole is finely illustrated, and is got up in the handsome style of the recent publications of this company.

Apropos of the letter of Miller Brothers' Cutlery Company, which appeared in our issue of the 5th inst., we have received the following communication:

To the Editor of The Iron Age: Mr. John Wilson, the famous artisan, of Sheffield, is not so ignorant of Miller Brothers' cutlery as they think he is. Before I left for England last May I bought a few of their excellent pen knives, and gave two of them to my friend as a sample of American cutlery. He admired them in many respects, and thought they might be improved. For instance, the blades he thought were not as well ground as those of the best Sheffield knives, but acknowledged they were superior to any foreign knives he had seen. I told him the impression was getting to be very general in America, that in a very few years there would be but little, if anything, in the line of cutlery or tools imported from Sheffield. I showed him samples of our Chisels and Gouges, which he admitted to be equal to any in the world, and expressed a regret that the American cutlery and edge tool firms were not better represented at Vienna. I told him there was very little encouragement, and our foreign rivals would be more benefited than we should. But if he wished to see American productions at their best, to come to our American Exposition in 1876, and report on it as he had done at London, Paris and Vienna.

RICHARD T. BUCK.
Millbury, Mass., Feb. 10, 1874.

Alfred Field & Co., No. 47 John street, have taken the agency of Withington, Cooley & Co.'s Garden and Farming Tools, and will carry a stock of these goods in New York, or orders can be shipped from the factory at Jackson, Mich., as desired. We publish below the revised list for these goods, the discounts from which to the jobbing trade are as follows:

Socket and Solid Shank Hoes	
Plain	50
Planted	52
Shovel	54
Spade	56
Scythe	58
Reaper	60
Scythe	62
Reaper	64
Scythe	66
Reaper	68
Scythe	70
Reaper	72
Scythe	74
Reaper	76
Scythe	78
Reaper	80
Scythe	82
Reaper	84
Scythe	86
Reaper	88
Scythe	90
Reaper	92
Scythe	94
Reaper	96
Scythe	98
Reaper	100
Scythe	102
Reaper	104
Scythe	106
Reaper	108
Scythe	110
Reaper	112
Scythe	114
Reaper	116
Scythe	118
Reaper	120
Scythe	122
Reaper	124
Scythe	126
Reaper	128
Scythe	130
Reaper	132
Scythe	134
Reaper	136
Scythe	138
Reaper	140
Scythe	142
Reaper	144
Scythe	146
Reaper	148
Scythe	150
Reaper	152

Catalogue pages	Discount per cent
45. Washita Oil Stone, mounted	15
" " not mounted	50
45. Axe Stone	30
45. Ronde Edge Lips	30
45. Knife Slips	10
45. Hindostan Stone	10
106 & 107. Shears and Scissors	65 & 10
107. Pruning Shears	10
108. Bright Wire Screw Eyes	65 & 10
108. " " Small Tools	65 & 10
108. " " Melt Hooks	65 & 10
109. " " Cornice Hook	65 & 10
109. " " Gate and Shutter Hooks	65 & 10
109. " " Wardrobe Hooks	65 & 10
109. " " Cup Hooks	65 & 10
108 & 109. Brass Eyes, Hooks, &c.	40 & 10
110 to 112. File	5
113 to 116. Padlocks	20
117. " " Gauges	25
118. Machines Steel Squares	20
119. Dowel Pointers	10
119. Spike Trimmers	10
120. Box Scrapers	20
120. Pencll Compass Attachment	30
120. Compases	30
120. Patent Dividers	30
120. Dividers without Spring, same list as with Spring	35
120 & 121. Calipers	35
122. Sardinia Box Openers, Nos. 1 & 3 and 4	20
122. " " Nos. 7, 8 and 9	20
122. Oyster Knives	25
122. Sardine Scissors	30
122 & 123. Fluting Scissors	25
123. Pinching Irons	25
123. Curving Tongues	25
124. Curving Irons	40
124. Gas P. V.	30
124. " " Scapeters	20
124. Tack Hammers	20
125. Saw Sets	20
125. Segar Box Knives	25
125. Carpet Stretch rs.	25
126. Tr. mnel Heads	25
127. Scandinavian Jali Pa hock	5
128. Davis' Patent Duplex Wrenches	25
Change list as follows: 8 inch, \$1; 12 inch, \$1.50; 15 inch, \$2; 18 inch, \$2 per doz	
128. Railroad Wrenches	30
129. Adj. stable Double End Wrenches	25
130. Lull & Porter Blind or Shutter Hinges	4 & 10
131. 2 dozen or more orders for	10, 10 & 5
132. Inside Fa-teens for Shutter Hinges	30
136. Self-shutting Heavy Gate Hinges and Gate Latches	add 5
136. Reversible Self-shutting Gate Hinge	20 & 10
137 & 138. Empire Gate Hinge	15 & 10
139. Barn Door Hangers, heavy	50
140. Single Rail	5
140. Extra Tie Rail (Change list 10c per foot)	5
140. Barn Door Hangers, light	50
140. Light Rail for do	40
142. Sliding Door Rail	50
147. Hitch Weights	25
147. Post Caps	25
148. Patent Con and Hat Hook Racks	25
151. Sad Irons	15
154. Mann's Patent Metallic Sieves	15
154. lots of 25 doz	50
Reduce the List 5c per doz, on all but No. 30. Delivered only at our Store or at Factory	
156. Ball's Patent Corfles Pins	20
158. Messenger as Openers	10
158. Blackboard Crayons	30
162. Patent IXL Wool Saws	20
160 & 181. Skates	40
182. Hand Bells	65
186. Flexible Curry Combs	35
186. Elk Leathered Curry and Horse Cards	40
186. " Wood	35
186 to 206. Brushes, revised list	50
REVISED LIST OF ENTERPRISE MANUFACTURING CO.'S COFFEE, DRUG AND SPICE MILLS <i>Champion Mills (Old Style.)</i>	
No. 1. Mill with Brass Hopper	\$33.00
No. 1. " Iron	25.00
No. 2. " Iron	23.00
No. 3. " Iron	17.00
No. 4. " Iron	5.00
American Mills (New Style.)	
No. 4. Mill with Iron Hopper	\$2.00
No. 5. " Brass	6.00
No. 6. " Iron	9.00
No. 7. " Brass	10.00
No. 8. " Iron	15.00
No. 9. Drug Mill with Iron Hopper	16.00
No. 10. " Brass	23.00
No. 11. Counter Mill with Iron Hopper, 1 Fly Wheel	18.00
No. 12. Counter Mill with Iron Hopper, 2 Fly Wheels	22.00
No. 13. Counter Mill with Brass Hopper, 1 Fly Wheel	26.00
No. 14. Counter Mill with Brass Hopper, 2 Fly Wheels	30.00
No. 15. Stand Mill with Iron Hopper, 1 Fly Wheel	32.00
No. 16. Stand Mill with Brass Hopper, 2 Fly Wheels	37.00
No. 17. Stand Mill with Brass Hopper, 1 Fly Wheel	40.00
No. 18. Stand Mill with Brass Hopper, 2 Fly Wheels	45.00
No. 19. Stand Mill with Iron Hopper, 1 Fly Wheel	50.00
No. 20. Stand Mill with Iron Hopper, 2 Fly Wheels	65.00
No. 21. Stand Mill with Brass Hopper, 1 Fly Wheel	65.00
No. 22. Stand Mill with Brass Hopper, 2 Fly Wheels	75.00
No. 23. Stand Mill with Brass Hopper, 2 Fly Wheels, Steam Power	85.00
Horse Shoes were advanced 25 cents per kg on the 12th instant, making the quotations \$5.25 for Horse, and \$6.25 for Mule, at Troy The New York prices are as follows:	
Burdons'.	Per kg \$5.75
R. I. Horse Shoe Co., Perkins' Pattern.	5.75
" " R. I. Fetter.	5.87 5
Mule Shoes.	6.97 5
Lane, Gale & Co. correct the quotation of Eagle Square Co.'s Boring Machines, for which they are sole agents, to read as follows:	
No. 5 Straight, with wt Angers	net \$2.50
No. 2 Angular.	net 4.50
Sargent & Co. issue the following correction of the list prices in the condensed list of Mal- lory, Wheeler & Co.'s goods, (pages viii and xv) of their pamphlet of discounts), as follows:	
Mineral Shutter Knobs.	
Inch..... 1 1/4 1 1/2 1 1/2 2 2 1/2	
Per gross, \$8.25 6.75 6.25 7.25 7.75 8.50	
Mineral Drawer Knobs.	
Inch..... 1 1/4 1 1/2 1 1/2 2 2 1/2	
Per gross, \$6.50 7.00 7.50 8.25 9.50	
English Bronze Door Knobs.	
No. 2.026. \$18.00 2.028. 15.00 per dozen.	
These articles are affected by the combi- nation of Lock manufacturers. In a small part of our edition last week we carelessly omitted to state that Sargent & Co.'s regular cash discount of 10 per cent. was allowed on all their goods, in addition to the prices quoted from their discount sheet. This discount is so well understood, however, that we suppose no one was misled by its omission.	
The letter order received by the Stanley Rule and Level Co., one day of last week, include: over four hundred "Bailey's Patent Adjustable Plates," indicating a growing appreciation of these excellent tools amongst dealers and mechanics.	
J. Clark Wilson & Co. have issued the fol- lowing lists and discounts for the goods of the Davis Level and Tool Co., of Springfield, Mass., for whom they are agents:	
Adjustable Spirit Level, Plumb and Inclinometer. Discount 40 per cent.	
Nos. 2, 3, 4, 5	W. od. per doz. \$3.00 4.00 4.50 6.00
Nos. 1, 2, 3, 4	1.00 2.00 3.00 4.00
1.00 per doz.	4.50 6.00 6.50 6.50

First Quality Levels and Plumb.			
Brass Lipped, Side Views, Polished, Tipped and Ad- justable—Assorted.			
No. 6. Plumb and Level, Full Mounted.	15 in.	\$7.00	\$38.00
No. 10. Plumb and Level, Full Mounted.	15 in.	11.00	60.00
No. 12. Plumb and L. od. D'Orsi Plumb.	26 to 30 in.	13.00	69.00
No. 14. Plumb, Level and In- clinometer.	24 to 30 in.	16.00	120.00
No. 16. Level.	12 to 20 in.	10.00	
No. 18. Plumb, and Level	24 to 30 in.	18.00	
No. 20. Plumb and Level, Side Views, Polished, and Ad- justable.	15 in.	21.00	
No. 22. Mason's Double Plumb and Level, Side Views, Pol- ished and Ad- justable.	26 to 30 in.	30.00	
No. 25. Plumb and Level, Brass Lipped, Side Views, Pol- ished and Ad- justable.	26 to 30 in.	48.00	
No. 28. Plumb and Level, Side Views, Pol., Tipped & Adjustable.	26 to 30 in.	51.00	
No. 32. Mason's Double Plumb and Level, Side Views, Pol- ished and Ad- justable.	36 in.	39.00	
No. 33. Mason's Double Plumb and Level, Side Views, Pol- ished and Ad- justable.	36 in.	45.00	
No. 34. Mason's Double Plumb and Level, Side Views, Pol- ished and Ad- justable.	36 in.	72.00	
No. 36. Mason's Double Plumb and Level, Side Views, Pol- ished and Ad- justable.	36 in.	68.00	
Iron Pocket Levels.			
Discount 25 per cent.			
No. 36. 2 1/2 inch, Iron Pocket Level, Jappanned		\$2.50	
No. 37. 3 1/2 inch		3.00	
No. 38. 4 1/2 inch		4.00	
No. 39. 5 1/2 inch		5.00	
No. 40. 6 1/2 inch		6.00	
No. 41. 7 1/2 inch		7.00	
No. 42. 8 1/2 inch		8.00	
No. 43. 9 1/2 inch		9.00	
No. 44. 10 1/2 inch		10.00	
No. 45. 11 1/2 inch		11.00	
No. 46. 12 1/2 inch		12.00	
No. 47. 13 1/2 inch		13.00	
No. 48. 14 1/2 inch		14.00	
No. 49. 15 1/2 inch		15.00	
No. 50. 16 1/2 inch		16.00	
No. 51. 17 1/2 inch		17.00	
No. 52. 18 1/2 inch		18.00	
No. 53. 19 1/2 inch		19.00	
No. 54. 20 1/2 inch		20.00	
Level and Plummet Glasses.			
Discount 60 per cent.			
No. 1. 1 1/2 inch long, packed in one dozen boxes		\$13.00	
No. 2. 1 1/2 inch long		14.00	
No. 3. 1 1/2 inch long		16.00	
No. 4. 2 1/2 inches long		19.00	
No. 5. 2 1/2 inches long		17.00	
No. 6. 3		18.00	
No. 7. 3 1/2 inches long		19.00	
No. 8. 4		20.00	
Iron Pocket Level, for Square or Straight Edge.			
Discount 50 per cent.			
No. 37 1/2		\$6.00	
Iron Planes.			
Discount 20 per cent.			
No. 45. Block Plane, 6 inches in length, 1 1/2 inch Cutter.		\$1.50	
No. 44. Smooth Plane, 8 inches in length, 2 inch Cutter.		3.50	
No. 46. Jack Plane, 15 inches in length, 2 1/2 inch Cutter.		4.00	
No. 46. Joiner Plane, 22 inches in length, 2 1/2 inch Cutter.		5.50	
We publish below Morris, Tasker & Co.'s revised list of Lap Welded Boiler Tubes, which we are informed, was adopted by all the manufacturers at their meeting on the 17th instant. The discount from this list is, to consumers, 5 per cent.; to the trade, 10 per cent.			
MANUFACTURER'S REVISED PRICE LIST OF LAP WELDED BOILER TUBES.			
Outside Diameter.	Thickness	Price.	Per Foot.
Inches.	Wire Gauge.		
1	15	\$0.24	
1 1/2	18	2.50	
2	24	2.50	
2 1/2	24	2.50	
3	27	2.50	
3 1/2	32	2.50	
4	32	2.50	
4 1/2	36	2.50	
5	36	2.50	
6	38	2.50	
7	38	2.50	
8	38	2.50	
9	38	2.50	
10	6	2.50	
J. Clark Wilson & Co. quote Chas. G. Beebe's Cotton Chalk and Fish Lines at discount 40 per cent. They also publish the following list of Warner's Door Stops. The discount from Rub- ber Tip is 20 per cent			

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(From our Regular Correspondent.)

SHEFFIELD, Eng., February 3, 1874.

THE STATE OF THE IRON MARKET.

The iron market proper is certainly pretty firm as to prices, but I do not hear of any very considerable amount of business being transacted. The elections, to which I made some allusion in my last week's communication, are hindering business to a certain extent, but not so seriously as might possibly have been the case had the time between the dissolution and day of reassembling been longer. As it is, most of the important boroughs and cities will have made their choice by the end of this week. The election for Sheffield takes place to-morrow. It is thus pretty clear that the interruption is brief, even though it may be for a few days pretty thorough, and that, therefore, we shall soon be rid of the frightful incubus of candidates' speeches. Speaking generally, my information leads me to believe that contracts for rails, chairs and other railroad iron are being entered into at low rates, in order to keep matters going until fuel has been laid ignominiously low, and that second-class men—both manufacturers and merchants—are disposing of their stock at prices which are very materially lower than those of the best houses. As an instance of the latter, I may state that although best Staffordshire bars are firm at £14 (Lord Dudley's £14. 12 6), yet good second-class iron can be had in any quantity at £12. 10, and very fair common bars as low as £11. 15. I do not for one moment doubt that a good average lot of Staffordshire common bars could be put f. o. b. at Liverpool for £11. 17 6, or from that to £12 per ton. This being so, it naturally occurs to one to ask

WHAT IS THE USE OF "LIST" PRICES?

To this query, I take it, there is no satisfactory reply. It may be, and no doubt is, of some service to the producers of branded iron—iron with a reputation all over the country—but I very much question whether the adherence of second and third-class men to the "list" is not altogether fallacious. As I have, on a previous occasion, remarked, in a rising market the list is all very well and affords a reasonable excuse for the little and middle-class manufacturer to demand current quotations, but in a falling state of trade where is the influence of the "list"? Nowhere! "Each man then doeth what seemeth best to himself"—as he ought under all circumstances to do. You will, of course, understand that I have no single word to adduce against such usual and highly commendable combinations of manufacturers—in vogue on both sides of the Atlantic—as are necessary and desirable for their mutual protection, and for the regulation of prices. I am simply and solely remarking upon what I know to be the bad effects of a so-called official list which is not adhered to. Better have no list at all.

FUEL IS COMING DOWN AT LAST!

The manufacturers say, and the British householders generally are disposed to jubilantly echo the exclamation. This time I fancy there is no doubt whatever about the matter. Thanks to an unusually mild winter, a more full public (high prices have brought about that change), and the lessened requirements of the iron and steel trade. Stocks have accumulated at every pit in the country, and prices are dropping helter skelter. The first of December brought a slight fall, the new year another and further one, and now February witnesses at its advent a third reduction—which is the most important of the trio. I have before me as I write copies of circulars from several colliery firms in this neighborhood announcing a lowering of prices varying from 2/ to 3/6 per ton. Best house coal is, after yesterday, to be had at 18/- per ton, and coke is brought down still lower than the 28/ and 29/ quoted last month. Happy steel melters, lucky iron manufacturers, halcyon days again are dawning, and you have the grim (perhaps grimly!) satisfaction of witnessing the long-foretold downfall of that coaly plutocracy whose sudden advancement has played such fantastic tricks with your respective callings.

NORTH OF THE TWEED.

In the North, at self-styled "Gles-ka" (Anglice Glasgow), the warrant market has been extremely quiet since the time last mentioned, and quotations have never risen higher than 104/-, while they were one day last week so lifeless as to sink a shilling lower than that figure. They are now stationary at 103 9, for cash. Some of the principal makers' brands are sympathetically a shilling or so easier, quotations being: Gartsherrie, No. 1, 13/-; No. 3, 107 6; Coltness, No. 1, 112 6; No. 3, 105 6; Carnbroe, No. 1, 110 6; No. 3, 107 6; Monkland, No. 1, 107 6; No. 3 105 6; Clyde, No. 1, 107 6; No. 3, 105 6; Govan, No. 1, 107 6; No. 3, 105 6; Langloan, No. 1, 112 6; No. 3, 107 6; Calder, No. 1, 112 6; No. 3, 107 6; Glengarnock, No. 1, 112 6; No. 3, 107 6; Eghamton, No. 1, 107 6; No. 3, 105 6; Dalmellington, No. 1, 107 6; No. 3, 105 6; Carron, No. 1, 112 6; Shotts, No. 1, 112 6; No. 3, 108 6; Kinclel, No. 1, 107 6; No. 3, 103 6.

As has of late been the case, shipments are on a much smaller scale, last week's total being as much as 4000 tons below that of the corresponding week of 1873, but only about 700 tons lower than during the week previous. On the other hand, the difference of price between Middlesbrough and Scotch pig is acting so much to the advantage of the former that the imports weekly get larger from Middlesbrough to the Scotch ports. Last week's total was 944 tons higher than that of the corresponding period of last year. The Scotch manufactured iron trade is fairly firm, most of the works being pretty fully employed. Large castings are £9 to £13, at Glasgow, and small £16 to £21, 10/- per ton. The iron pipe manufacturers, such as D. Y. Stewart & Co., Edingtons & MacLarens, are well employed, mainly on colonial and Continental orders. There are, however, a few large South American customers in hand for large pipes destined for the waterworks of the leading cities of those trans-Atlantic regions.

THE CLEVELAND DISTRICT.

is quiet, and prices have somewhat declined. Two or three English companies, a Belgian and a Dutch railway company, are in the field for large lots of iron and steel rails, consequently the Cleveland makers are beginning to look up, and have almost determined not to despair, albeit they have had little work for a few months. Prices in this district (which is, as you are probably aware, wealthy in coal and iron ore, but produces a rough, common iron), are now "tacky." Rails, £10. 5/- to £11; castings, £10. 7 6/-; bars, common, £12. 10/- to £13; angle and bulb iron, £12 to £13; boiler plates, £15 to £15. 10/-; cable iron, £13 to £13. 10/-; nail

rods, £12. 10/-; rivet iron, £12 to £13. 10/-; and ships plates, £18 to £18. 10/-; hoops, £14. 10/- to £15/-; heat bars, £13 to £13. 10/-; best bars, £14. 10/- to £15/-; and sheets (single), £17 to £17. 10/-.

THE SHEFFIELD TRADES.

arc, as a rule, which (in violation of the proverb) has not, to my knowledge, any exception, but indifferently employed. As to the general condition of business, I do not hear of much change. The heavier departments are slack, and all kinds of merchant iron are quiet. Second-class hoops, bars, tang iron, sheets and rounds are slightly easier, but best marked iron from other districts is held pretty firmly by the agents. Pig iron is unchanged. In the steel trade some of the more important works are better employed, several handy sized commissions having just come to hand from the United States. Steel for axes, plough plates, clock springs, and various other minor purposes, is in better request for the States; and I hear of two or three heavy consignments having been despatched this week. The file, saw, edge tool, brass, foundry, and other industries are, precisely the same condition as when last written of.

Relative to cutlery, I hear very different reports. One manufacturer assures me that "things are in a bad way." Trade, he says, is altogether wrong, and there won't be much improvement this next three months. Some of the large firms, he believes, are overstocked, and they are cutting prices in the States so fine as to run all the little men out of the field. On the other hand, a merchant tells me that he is doing very nicely in best table and certain other kinds of cutlery, not only for America, but some of the larger colonies. For really first class razors the inquiry has improved, but common goods of this class, inferior pocket, pen and table cutlery, do not, at present, meet with any encouragement. Shoe, butchers, and other knives of a specific class, are also in very fair request, as also are light edge tools for Australia and New Zealand.

BIRMINGHAM AND THE HARDWARE DISTRICT.

Birmingham—"that place of howling," as Mr. Roebuck once not very imptly termed it, in referring to its marvelously pronounced political development—is not quite so busy as it was. The hardware branches are prejudicially affected by the high price of iron, and I am afraid the action taken by the sheet makers, on Thursday, will not improve their position. The action I refer to is that taken by a private meeting of the galvanized sheet makers, held at Birmingham. They unanimously resolved to fix the quotation for galvanized sheets of 24 gauge at £24. 15 per ton, an advance of £2. 10/-! They further decided to make the difference, in future, between 24 and 26 gauge, £3, instead of £2, as has hitherto been done. The makers of ordinary sheets (single) decided to make every distinct gauge subject to a sliding scale of 10/- per ton, instead of grouping sheets as hitherto under the three headings of "singles," "doubles" and "lattens." These alterations are of much importance, and will, I think, be found to operate at first somewhat to the disadvantage of the hardware men. In the same district iron is dull, and the attendance on change is but small. B. H. and other marked bars, are still £14; all mine pig, £7 to £7. 10/-; and other kinds in proportion. The tin plate and Japan firms announce that, in consequence of the considerable advance in wages which they have given to their work people, and owing also to the continued high prices of all kinds of materials, they have been reluctantly compelled to reduce discounts by 5 per cent. The saddle trade of Walsall, lock trade of Willenhall, chain business of Stourport and Dudley, are moderately well engaged. Chains are quoted at full rates, particularly the medium size. Curry combs are in fair demand for the United States, Canada and Australia. The small arms factories are doing well on their old orders for the Russian and German governments, the new and converted rifles necessarily requiring several million cartridges, which are also being made at Birmingham.

SOUTH WALES.

does not contribute any very exciting news this week. Further orders for rails are understood to have been received by two or three of the largest works, the price being at or about £10 to £10. 5. It is quite possible that a further slight increase of business may send up prices 10/- to 15/- per ton. Tin plates are firm at the figures: I. C. coke, 29/- to 30/-; I. X. coke, 35/- to 36/-; I. C. charcoal, 36/- to 38/-; I. X. char coal, 42/- to 44/- per box of 225 sheets, at the works.

METALS.

are again quiet and prices have a falling tendency all round. Messrs. Von Daddatz & North say copper is decidedly quiet, and little done; sales of good ordinary brands Chili made at £81 to £81. 10/- cash; Wallaroo sold in small lots at £91. 10 to £92; Burn, £91. Tin Straits was sold in small lots at £117 to £118 for immediate delivery, and at £116 for Feb. 1st delivery. The Dutch sale went off on Thursday at an average of about 70/- fl. to 75/- fl. per 50 kilos, equal to about £10. 10. 10. 500 slabs Banca on Dutch warrants, sale prompt, were sold here late on Thursday at £120, and Straits have been sold for immediate cash at £115. About 80 tons of Australian iron have been disposed of during the week from £115 to £112; the last sale reported was 10 tons on Thursday, at £113. English is unsteady; smelters ask £118 for common ingots, but second-hand lots in warehouse were sold as low as £116. Tin plates are steady. Lead still rather unsettled; good soft English nominally £25/- to £23. 10/- Spelter lower. Ordinary brands, £25/-; special, 25. 5/- to 25. 10/-.

Messrs. French, Smith & Co.'s (London) circular says: Copper—Charters for the last fortnight in December are advised as 220 tons. Chili bar has receded to £81, and Wallaroo to £82, at which there has been more doing. Tin.

Telegrams from Rotterdam announce that the 1000 slabs Banca offered there to-day realized from 70/- fr. to 71 1/2 fr.; average, 70 1/2 fr., equal to £121 laid down here. Straits is quoted £117. Lead.—It is reported that the stocks held by the failed houses have been sold for export, but no particulars have transpired.

FOREIGN.

(Monteur des Intérêts Matériels.)

PARIS, Feb. 1, 1874.—Metals.—No striking change has as yet been observable in the metal markets of Europe, with the exception of tin and lead; business is still quiet. The restricted and the demand irregular. The number of offers is still great, but as the time goes on, a general decline will ensue. An attempt will be made, by a lowering of prices, to bring about some sort of revival. The London market for copper has been heavy the greater part of the week, but no particulars have been sold for export, but no particulars have transpired.

FRANCE.

(Monteur des Intérêts Matériels.)

PARIS, Feb. 1, 1874.—Metals.—No striking change has as yet been observable in the metal markets of Europe, with the exception of tin and lead; business is still quiet. The restricted and the demand irregular. The number of offers is still great, but as the time goes on, a general decline will ensue. An attempt will be made, by a lowering of prices, to bring about some sort of revival. The London market for copper has been heavy the greater part of the week, but no particulars have been sold for export, but no particulars have transpired.

don has been feebly sustained in consequence, and closes with a declining tendency. Nothing doing at Paris, and we also tend downward. Banca delivered here and at Havre 39 francs. Warrant is too weak. The signal from Holland has at once paralyzed all the German markets; thus Banca is 41% to 42% at Berlin and Stettin, 49. Hamburg is 130 to 135 for Barca. A cable despatch from Penang dated 22 January quotes Tin \$30-80 per picul. Lead.—Affairs in Spain, and particularly the troubles at Cartagena, have, however, been six months exerted a favorable influence upon the value of the metal. Cartagena was therefore retained by the national army, it was expected that large quantities would come forth from that city. But these expectations have been most seriously frustrated. The siege has had a most detrimental effect upon Lead industry in that vicinity, and a long time will pass ere it can be restored to its former importance. Meanwhile, Lead ore has risen in value in a most extraordinary manner throughout the Peninsula, and as ore contracts are made for a whole year, it is evident that Spanish miners cannot deliver to trade in 1874 an article in keeping with the value now current abroad. The long absence of miners at Cartagena has stopped work in the mines and smelting establishments, and the Lead ore from other quarters of Spain, especially Llubars, has been all bought up at extravagant figures. When these facts became known the London market immediately assumed quite an altered character, and the price of Lead fell. The trade nevertheless brought about a slight giving way, a rush of purchasers produced an instantaneous revivification. Thus, on the 27th ultimo, during a single day 3000 tons were bought up on private terms; the next day 300 tons English sold at £22. 7 6. On us here the discovery of this encouraging state of affairs has had no effect whatever thus far. We are listless at 5 francs, domestic Lead; Spanish at 39. 50%; Warrant 40%. Tin is 56 to 57. Germany seems to have been thrown into a condition of uncertainty; thus Berlin is firm, and Hamburg weak. Stettin is steady at 83% to 84% for German; San Andres, 8%; Rein & Co. (also Spanish) at 9%. Spelter.

The improvement alluded to in our last general European review has not been sustained. London, Silesian, £25, and C. G. H., £25. 15., to arrive. Paris and Havre 67 to 68 francs. Marseilles unchanged. Germany with little doing, but unaltered and firm; Berlin W. H., 40 francs; Stettin 93 to 95. Hamburg 90 marks, nominally. Iron—stagflation in Iron industry is prolonged in a manner which begins to seriously affect prices, which are getting weak, and in some iron centers even a downward movement of the most perceptible kind. Iron in the Meuse and Moselle a drop has occurred to 160 on an average. Coke Pig Iron in the Champagne is down to 160 for No. 1, and to 155 for No. 2. Northern works are firm, the interior iron, the Southern works are bad for American account. The United States seemingly being about to revive in this branch. The Coal market is utterly demoralized. Great preparations are going on to increase production among us after 1873, already 2,000,000 tons over and above 1872—16,500,000 against 14,500,000.

BELGIUM.

(Moniteur des Intérêts Matériels.)

BRUSSELS, Feb. 1, 1874.—Iron.—The week just closed to a close has been but a poor one in the Iron trade, and hardly anything has transpired anywhere in Belgium. Some limited business has been done in Railways. Some Sheet Iron commands have dropped from France, Holland and even England, and some small orders from the interior. Wrought Iron, W. H. and similar iron is 90 francs. Iron in the Ardennes is 90 to 100, and "moulage" 130. Sheet Iron is quoted at 280. Low as we are, it is not easy to get neighboring nations to take our Iron; they seem to have made up their minds to let us drop to an as yet unknown low figure, ere they call upon us, so as to place our market in a sort of helpless condition and well fitted to keep down all the remaining markets until they have consummated their speculative operations. While the iron is going down to Belgium, the scene of English, German and French speculators, we have but one remedy left, that of turning our eyes toward American and Asiatic countries, and trying to be independent of our European neighbor. The best we can do is to establish agencies in those countries. Even our railroad equipment firms are doing scarcely anything; the few tolerably busy on old contracts are looking with some concern into the future, when they are called upon. The only consolation is that necessity under which the English railroad car manufacturers shall be compelled to dismiss Belgian manufacturing interests are in a critical position. Coal.—Very little has transpired during the week, but we are a week nearer spring time, and this itself should suffice to produce an additional decline in the fuel. Holders of coal are in a poor plight indeed, not one of them of coke better off, being about 10/- per ton. The decline is general, even greater at Liege than at Charleroi, extending to the Rur country as well as to Eben.

HOLLAND.

(Koch & Vlierboom.)

ROTTERDAM, Jan. 31, 1874.—Tin.—The following are the Maatschappij Tin statistics for the present month:

	1874.	1873.
Banca.	Slabs.	Slabs.
January deliveries.	6,258	6,201
Present stock of Warrants.	34,225	28,251
Present unsold stock.	105,548	83,473
Afsoit.	5,400	23,170
Billiton.		
January deliveries.	1,500	
Present stock of Warrants.	100	481
Present unsold stock.	3,067	
Present stock, private.	24,053	7,227

Lates Tin Telegrams.

LONDON, Feb. 14, 1874.—Tin—Weak at £106.

SINGAPORE, Feb. 14, 1874.—Tin—Nominal at \$30 per picul.

EAST INDIES.

(A. Koch & Vlierboom.)

COLONIA (Ceylon), Dec. 41, 1873.—Plumbago.—The export duty—The payment of "royalty" on this article having been much evaded and led to many abuses, has caused government to impose an export duty of 5 percent. *ad valorem*. Instead of this was to be imposed to come into effect on the 1st February next, and caused a great alarm to ship, both on the part of European and native sailors, in order to escape the possibility of having to pay both duties. This has had the effect of lowering prices, by causing an increased desire on the part of native dealers past fortnight to sell. Merchants, however, having represented to the government that the 1st of February was too early a date with so short a notice of the change, the time has been extended to the 1st of April, and this extension has, in consequence, abated. We do not know for certain if immediate decline in prices of Plumbago, and quote £19. 10. 10.; Clp. £9. 10.; Dust, £5. 5/- per ton, free on board, at which rates orders can now be executed. The Imogene is going on loading slowly for New York, and will probably get away about the middle of next month. We do not hear of any change in the United States. Shipments since Oct. 1, 1873, to the latter country from Ceylon, 15,180 cwt., against 15,224 the previous season.

JAPANNED and PATENT EUREKA

Bright Metal

BIRD CAGES.

No. 247 & 249 Pearl Street
NEW YORK.

First & Prybil's

461 to 467 W. 40th St.
New York City.

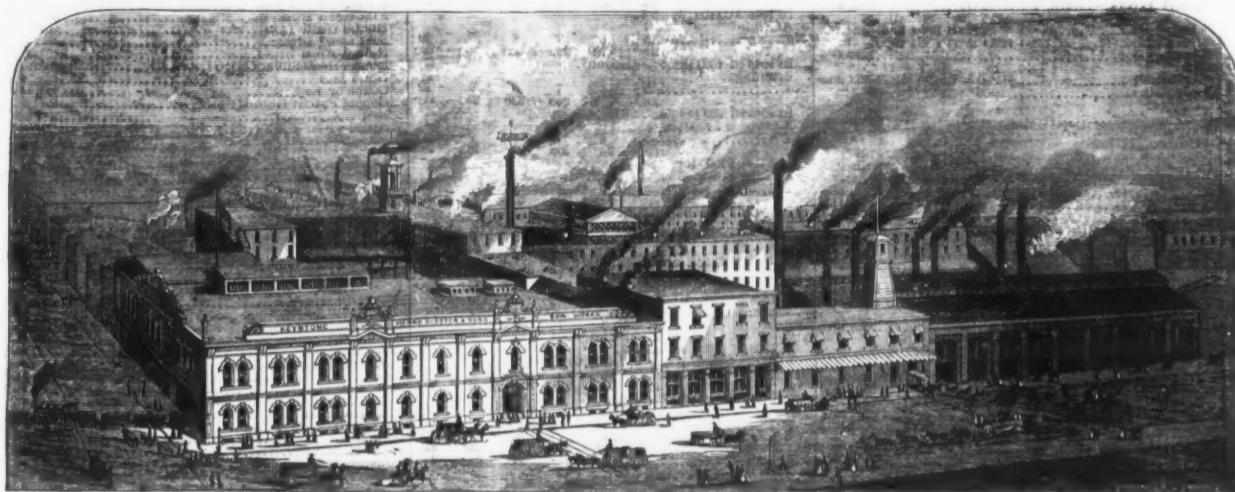
Patent Improved BAND SAW MACHINES.

For Bevel and Square Scroll Work and Re-sawing. Manufacture six different sizes, price £150 to £300. £50, £60, £425, and £1000. Also manufac. CARVING, SHAPING, FLUTING, ADJUSTABLE DOUBLE SPINDLE BOARING, CARVED and SERPENTINE MOLDING, BALANCED OR BALANCING LATHE, WOOD and BRASS TURNING, METAL SPINNING, etc. CIRCULAR SAW BENCHES, SHIFTING PULLEYS, etc.

A large assortment of the best FRENCH BAND SAW BLADES, at greatly reduced prices. And a Machine that will set an ordinary Band saw PERFECT in two and

Keystone Saw, Tool, Steel and File Works,

PHILADELPHIA.



HENRY DISSTON & SONS,

MANUFACTURERS OF

Warranted Cast Steel Patent Ground & Tempered Hand, Panel & Rip Saws,

Disston & Sons' Patent Improved Combination Hand Saws,
"Mechanics' Own" Hand and Back Saws, to run without Set,
Gent's Half Back Bench Saws,
Cast Steel Compass Saws,
Cast Steel Table and Pruning Saws,
Improved Quality Cast Steel Back Saws, with Steel Backs,
Butchers' Bow Back Saws,

Turning or Chair Webs,
Felloe Webs,
Butchers' Saw Blades,
Improved Reversible Hack Saws,
Hack Saw Blades,
Patent Ground and Tempered Cast Steel Wood Saws,
Wood Saw Frames,
Saw Handles, all kinds,

Patent Ground and Tempered Circular Saws, Circular Top Saws for Double Mills,

Warranted Extra Cast Steel Shingle Saws, Concave Saws, Circular Saw Mandrels of the latest and most approved styles

Warranted Extra Cast Steel Patent Ground and Tempered Mill, Mulay, Gang and Drag Saws.

Disston's "Great American" Cross Cut Saw.

"	"	Lumberman	"	"
"	"	Climax	"	"
"	"	Nonpareil	"	"

Extra Spring Steel Plain Tooth Cross Cuts, Set and Sharpened.

Hook Tooth Cross Cut Saws No. 2, Set and Sharpened.

Hook Tooth Cross Cut Saws No. 3, Set and Sharpened.

Cast Steel Plain Tooth Cross Cuts Nos. 2 & 3, Set and Sharpened.

HENRY DISSTON & SONS' WARRANTED SAW FILES.

We manufacture Files specially adapted for keeping in order the Teeth of our Improved Cross Cut Saws, "The Great American," "The Lumberman," "The Climax," "The Nonpareil."

NOTICE.

Our No. 7 Hand Saws have attained a National reputation for uniform excellence of manufacture, of which we are justly proud, and we take this method of assuring the trade that these Saws for 1874, will exceed in point of finish all previous efforts to meet the wishes of our friends.

New York Wholesale Prices, February 18, 1874.

HARDWARE.

ANVILS.
Sul Cast Steel. \$200
Wright's. 10 lb. gold. 10 over 200 lbs. 12 lb. gold
Armita's House Hole. 10 lb. gold. 11c
Villanova's. 10 lb. gold. 11c
Eagle Avn. s. & 10c currency. 15 @ 15d & 5

Apple P. rs.

Ridge. 100 lbs. \$8.30 per doz.

Conqueror. 100 lbs. \$8.30 per doz.

Reading. 100 lbs. \$8.00 per doz.

Union. 100 lbs. \$7.80 per doz.

Bay Tree, Filing, Coring and Slicing. 100 lbs. \$7.50 per doz.

Skeleton. 100 lbs. \$7.00 per doz.

Climax-Slicer. 100 lbs. \$7.00 per doz.

Bay Steel French Paper. 100 lbs. \$7.00 per doz.

Lighting. 100 lbs. \$7.00 per doz.

Pestle and Mortar. 100 lbs. \$7.00 per doz.

Augers and Bits. 100 lbs. \$7.00 per doz.

Snell Mfg. Co. 100 lbs. \$7.00 per doz.

Russell Jennings. 100 lbs. \$7.00 per doz.

Douglas Mfg. Co. Extra. 100 lbs. \$7.00 per doz.

" Hollow Augers. 100 lbs. \$7.00 per doz.

Cushman's Expanding Hollow Augers. 100 lbs. \$7.00 per doz.

Ives' Augers and Bits. 100 lbs. \$7.00 per doz.

Groge Lin Augers and Bits. 100 lbs. \$7.00 per doz.

增加 Bits. 100 lbs. \$7.00 per doz.

Cook's Patent Augers. 100 lbs. \$7.00 per doz.

Bits. 100 lbs. \$7.00 per doz.

Andrews' Bits. 100 lbs. \$7.00 per doz.

Shepard's Double Cut Bits. 100 lbs. \$7.00 per doz.

Griswold's Patent. 100 lbs. \$7.00 per doz.

Cast Iron Augers. 100 lbs. \$7.00 per doz.

Anger Bits. 100 lbs. \$7.00 per doz.

Long Augers. new list \$7.00 per doz.

Bonne's Patent Hollow. 100 lbs. \$7.00 per doz.

Stearns' Bit stock Drills. 100 lbs. \$7.00 per doz.

Nobles Mfg. Co. C. S. Cut Augers. 100 lbs. \$7.00 per doz.

Watrous Slip Augers. 100 lbs. \$7.00 per doz.

Axes.

Blood's. 100 lbs. \$15.00 per doz.

Burns'. 100 lbs. \$15.00 per doz.

Collins'. 100 lbs. \$15.00 per doz.

Burd's. 100 lbs. \$15.00 per doz.

Sauveterre Mfg. Co. 100 lbs. \$15.00 per doz.

Sims'.

Morgan's.

Red Jacket.

Manu's.

Underhill's Double Bit. 100 lbs. \$15.00 per doz.

Powell's Tool Co. Patent. 100 lbs. \$15.00 per doz.

Underhill's Crown. 100 lbs. \$15.00 per doz.

John Leverett's. 100 lbs. \$15.00 per doz.

Nobes Mfg. Co. D. B. 100 lbs. \$15.00 per doz.

D. B. 100 lbs. \$15.00 per doz.

Balances.

Chatillon's. new list \$15.00 per doz.

Frary's.

Morton's.

Bridges.

Plated.

Iron (Plated list). 100 lbs. \$15.00 per doz.

Brass (Plated list). 100 lbs. \$15.00 per doz.

Opener.

Boat.

Hand Light Brass.

White Metal.

Glue.

A. W. Taylor's Patent Door.

Western Gong.

Brook's Drums.

Hart Mfg. Co. Crank and Pull.

Cow-Common Wrought.

Western.

Kentucky's Genuine Kentucky.

Yan's Genuine.

Bellows.

Flame.

Blind Fasteners.

Cork Lined Wood.

Fence.

Flame.

Enameled and Tinned Ware.

Faucets.

Enamel.

Washington Mills Regal No. 1.

Flour.

Flour and Regal No. 2.

Flour and Regal No. 3.

Flour and Regal No. 4.

Flour and Regal No. 5.

Flour and Regal No. 6.

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Flour and Regal No. 78.

Flour and Regal No. 79.

Flour and Regal No. 80.

Flour and Regal No. 81.

Circles less than 84 inch in diameter..... \$8c. per lb.
Circles, 84 inch diameter and over..... \$1c. per lb.
Segment and Pattern Sheets..... \$8c. per lb.
Locomotive Fire Box Sheets..... \$8c. per lb.
Sheathing Copper, over 12 oz. per sq. ft. 12 oz. per sq. ft., and lighter..... \$1c. per lb.
Bolt Copper..... \$1c. per lb.
No Copper is Sheathing except 14x48 inches, and not to exceed 34 oz. to the square foot.

TINNING..... \$8c. per sheet
14x48, by the case..... \$8c. per sheet
14x48, less than case..... \$10c. per sheet
Boiler Sizes, 7 and 8 inch..... \$12c. per sheet
Other sizes not larger than 30x60..... \$2c. per sq. ft.
Copper Bottoms, 36c. per sq. ft.

O'NEILL'S PATENT PLATED COPPER.....
14 and 16 oz. and heavier..... \$8c. per lb.
12 oz. and lighter..... \$12c. per lb.
7 in., 14x36, 8 in., 14x48, 9 in., 14x60
14 and 16 oz. and heavier..... \$1c. per lb.
(All sizes not over 30 inches wide.)

14 and 16 oz. and heavier..... \$8c. per lb.
12 oz. and lighter..... \$12c. per lb.
LEAD-DUTY: Pig, \$4 per 100 lbs.; old Lead, 14 cent per lb.; Pipe and Sheet, 24 cents per lb. All subject to a reduction of 10 per cent.

Spanner..... 6c. @ 5c gold
German Refined..... 6c. @ 5c gold
English..... 6c. @ 5c gold
Bar..... 10c.
Pipes..... 12c. per lb.
Tin Lined Pipe..... 10c.
Sheet..... 10c.
Shot..... 10c.
10c. Drop, 11c.
Solder, No. 1..... 10c.
STEEL-DUTY: Bars, Ingots, Sheets and Coils, valued at 7 cents per lb., or under, 2 cents; over 7 cents, and not above 11, 8 cents per lb.; over 11, 8½ cents per lb., and 10 to 12, 10 cents per lb. Bars, 1 cent per lb.; Rail-ways, 1 cent per lb.; all subject to a reduction of 10 per cent. Provided that Metal cemented, cast or made from Iron by the Bessemer or pneumatic process, of whatever form or description, shall be classed as Steel.

American Cast Steel.
Tool..... \$10c.
Spring..... 12c.
Homogeneous..... 12c.
Machinery (round and square)..... 12c.
File..... 12c.
Sheets..... 10c.
Saw Plate, mill and miter..... 14c.
Saw Plate, gang and X cut..... 14c.
Circular as to size..... 18c. @ 30c.

Chrome Steel.
Tool, extra fine..... \$10c. @ 21c.
Spring..... \$10c. @ 25c.
Machinery..... \$10c. @ 14c.
Gun or Homogeneous..... 18c.
English Steel, payable in gold, dia 5% each.

English Steel, Best Cast..... \$10c.
Extra Cast..... 10c.
" Household, Cut..... 10c.
" Swaged, Cast..... 10c.
" Beat Double Shear..... 10c.
" Blister, 1st quality..... 10c.
" " 2d quality..... 10c.
German Steel, Best..... 10c.
do 2d quality..... 10c.

Sheet Cast Steel, 1st quality..... 10c.
" 2d quality..... 10c.
" 3d quality..... 10c.

File Steel, Flat and Round..... 12c.
Square and Round..... 13c.
" Mill..... 10c.
" Taper to a inch..... 10c.
Taper 3 to 4 inch..... 18c.

SPELTER-DUTY: In Pigs, Bars and Plates, \$1.50 per lb. 100 lbs. less 10 per cent.

Stein, cash..... 7½ @ 7½c. gold
American..... 8 @ 11c. currency

TIN-DUTY: Plates, Sheets, Tagger and Terne, 15 per cent. per lb.; Tin, 12 per cent. per lb.; Val-
ues, 10 per cent. per lb.; Bars, Blocks
and Pigs, free. Bars, subject to duty of 10 per cent.

Banca..... \$10c. per lb.
Straits..... \$10c. per lb.
English..... CHARCOAL TIN PLATE.

1 C 10x14, Prime Charcoal..... 12c.
12c. " " 12c.
14c. " " 14c.
1 X 10x14, " " 14c.
12x12, " " 12c.
14c. " " 14c.
D C 12x12, " " 14c.
D X 12x12, " " 14c.

For each additional X add..... 2c.

CORE TIN PLATE.
1 C 10x14, 3d quality. Ordinary..... 12c.
12c. " " 12c.
14c. " " 14c.
1 C 12x12, " " 12c.
14c. " " 14c.

FERNE PLATE.
Prime Charcoal..... 10c. @ 11c.
1 X 10x10, " " 10c. @ 11c.
1 C 12x12, " " 12c.
1 C 14x14, " " 14c.

ZINC-DUTY: Pig or Block, \$1.50 per 100 lbs. Sheet, 24c. per sq. ft. All subject to a reduction of 10 per cent.

Sheet..... open box.

New Price List of Iron Wood Screws.

X Inch.	1 Inch.	2½ Inch.
No. 0, 34	No. 11, 105	No. 15, 278
1, 34	12, 113	16, 310
2, 34	13, 126	17, 331
¾ Inch.	14, 139	18, 360
No. 1, 34	15, 158	20, 412
2, 34	16, 179	22, 504
3, 34	17, 197	24, 656
4, 34	18, 221	25, 721
5, 42	20, 305	No. 12, 234
6, 49	1½ Inch.	13, 255
7, 60	No. 7, 92	14, 278
8, 68	8, 100	15, 310
9, 76	9, 105	16, 331
10, 84	10, 113	17, 360
11, 92	11, 121	18, 383
12, 97	12, 131	19, 444
¾ Inch.	13, 144	22, 551
No. 2, 36	14, 160	24, 685
3, 36	15, 184	25, 724
4, 38	16, 210	No. 13, 278
5, 46	17, 230	14, 307
6, 56	18, 236	15, 315
7, 65	19, 247	16, 331
8, 76	20, 307	16, 360
9, 81	21, 341	17, 384
10, 87	22, 367	18, 407
11, 92	23, 381	19, 427
12, 97	24, 395	20, 447
¾ Inch.	25, 391	21, 467
No. 4, 40	26, 391	22, 485
5, 50	1½ Inch.	24, 508
6, 60	No. 9, 187	26, 998
7, 70	10, 142	34, 1016
8, 79	11, 150	No. 16, 494
9, 84	12, 165	17, 549
10, 89	13, 184	18, 614
11, 95	14, 207	20, 753
12, 100	15, 231	22, 874
13, 116	16, 255	24, 969
14, 126	17, 278	26, 1068
15, 147	18, 307	4 Inch.
16, 163	20, 532	20, 975
¾ Inch.	22, 407	20, 975
No. 5, 54	24, 486	22, 1024
6, 63	24, 1 Inch.	24, 1129
7, 72	No. 10, 130	26, 1260
8, 81	11, 163	4½ Inch.
9, 87	12, 186	No. 18, 840
10, 92	13, 207	20, 1018
11, 100	14, 231	22, 1129
12, 108	15, 255	24, 1260
13, 121	16, 278	26, 1418
14, 131	17, 307	5 Inch.
15, 152	18, 331	No. 20, 1181
16, 171	19, 353	22, 1313
¾ Inch.	22, 444	24, 1418
No. 5, 61	24, 591	26, 1575
6, 70	25, 1 Inch.	26, 1756
7, 80	No. 11, 186	No. 24, 1772
8, 87	12, 210	26, 2034
9, 92	13, 234	28, 2276
10, 97	14, 255	30, 2756

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wind, while it fails to show the true course of the same, by exhibiting merely its horizontal component. M. Tany proposes an arrangement to be attached to the ordinary lightning rod. Just above a suitable shoulder on the latter is placed a copper ring, grooved and made into a pulley easily rotated in a horizontal plane. Around this passes a knotted cord, the ends of which are secured to the extremities of a short stick or metal rod, to which is secured a simple streamer. Thus constructed the vane indicates a calm by falling vertically, and beside shows the strength of the wind by being blown out more or less from the lightning rod.

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Tarred Shaking..... 2½ cts.

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Chesee, dry..... 10c.
" Uamarine..... 10c.
Brown, Spanish..... 10c.
Van Dyke..... 10c.
Carmine, 40c.
Green, Chrome..... 10c.
" in oil..... good, 30c. best, 40c.
Mineral Paint, 10c.
Crucible Mineral..... 10c.
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" English..... 10c.
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Han... dark..... 10c.

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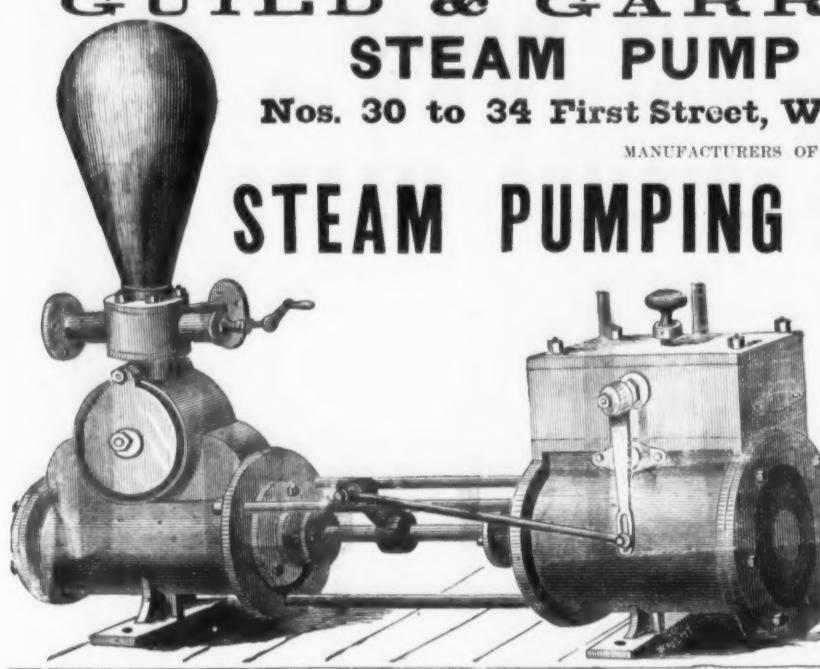
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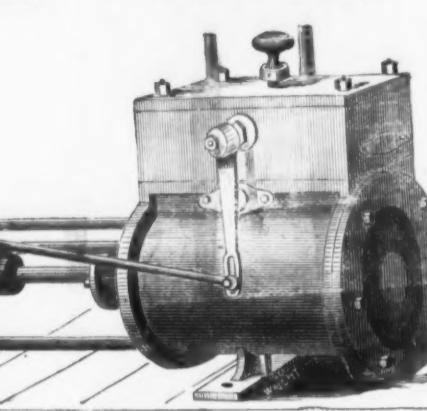
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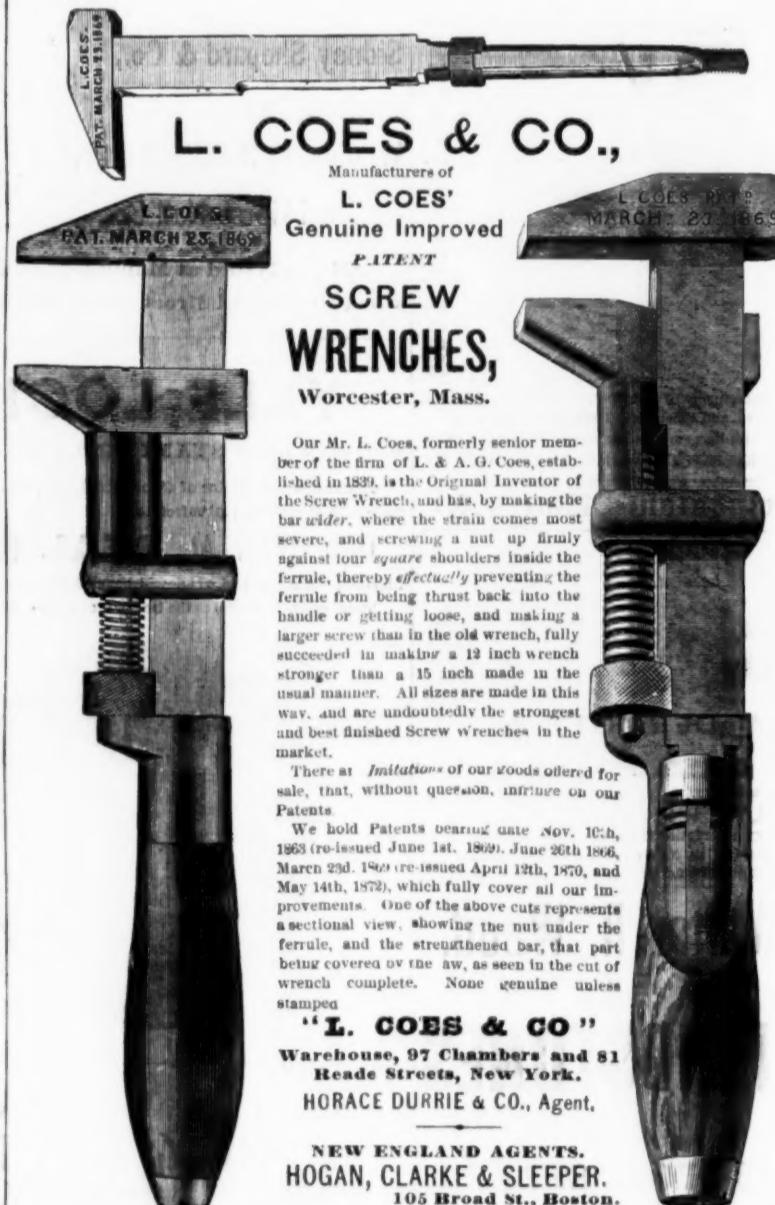


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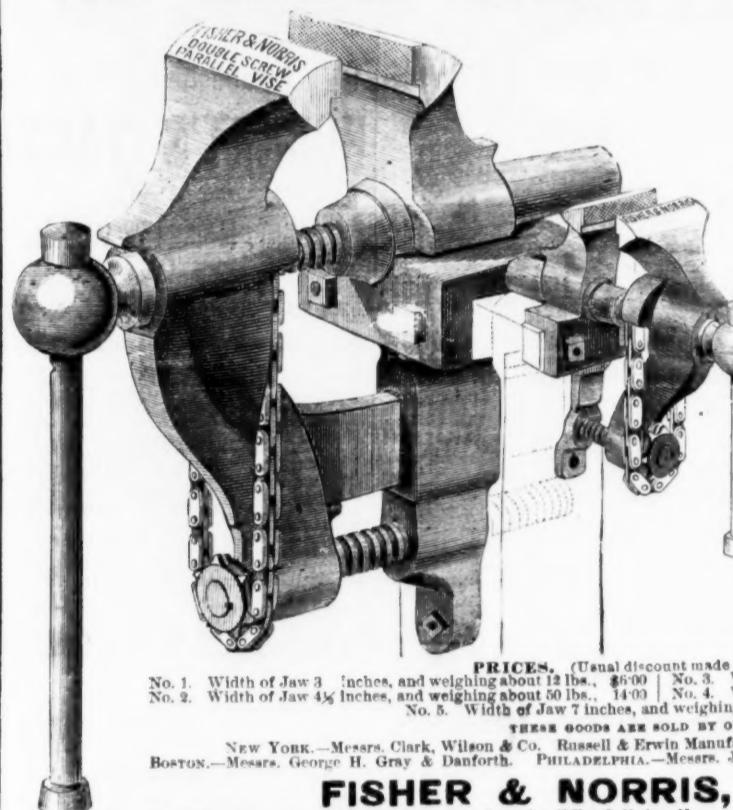
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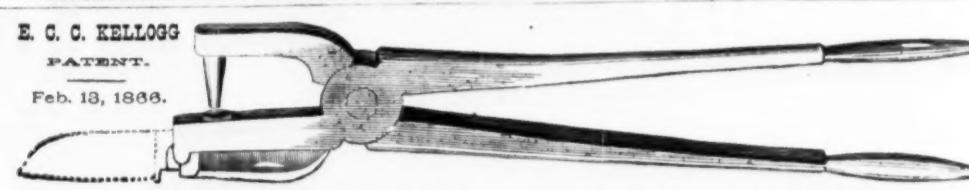
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Narrow.	dis 40% & 10 %
Line of Joint.	dis 40% & 10 %
Brackets.—Dove.	dis 40% & 10 %
Butts.—Cast Fast Joint, Narrow.	dis 40% & 10 %
Cast Loose Joint.	dis 40% & 10 %
Augins.	dis 40% & 10 %
Wrought Butts, Loose Pin.	dis 40% & 10 %
Brackets.—Rubber.	dis 40% & 10 %
Leather new list.	dis 40% & 10 %
Beaters, Eggs, "Peerless".	dis 40% & 10 %
Brick-Bath (box of 2 doz) Best English.	dis 40% & 10 %
"Fotherford".	dis 40% & 10 %
Bum Boilers—"Enterprise".	dis 40% & 10 %
Chalk—White, Carpenter's.	dis 40% & 10 %
Red, Carpenter's.	dis 40% & 10 %
Blue.	dis 40% & 10 %
Chisel—Firmer's Socket.	dis 40% & 10 %
Framing Socked.	dis 40% & 10 %
Corner Socket Chisel.	dis 40% & 10 %
Corner's Carpenter's.	dis 40% & 10 %
Gates Molasses.	dis 40% & 10 %
Patent Self-Measuring.	dis 40% & 10 %
Hinges—Window Blind.	dis 40% & 10 %
Jarke's No. 1.	dis 40% & 10 %
Orders for 5 dozen, discount \$5 per dozen.	dis 40% & 10 %
King Wingers (Iron Frame).	per doz \$7 00
Case Box.	per doz \$7 00
Patent Box and Side.	dis 40% & 10 %
Cutlers.—American Pocket (best).	dis 25 %
Lander, Frank, Clark J. Russell & Co., and Lamson & Goodnow, Mfg. Co., M. & S. offices.	dis 25 %
Drivings Nulvers.—Hart Mfg. Co. s.	dis 25 %
Concave Adjustable Handle.	dis 10 @ 15 %
Beatty.	dis 10 @ 15 %
Fry Pins.	dis 10 @ 15 %
Timber.	dis 10 @ 15 %
File.	dis 10 @ 15 %
Files.	dis 10 @ 15 %
Nicholson Mill Files.	new list, \$10 00 to £ cur dis 10 %
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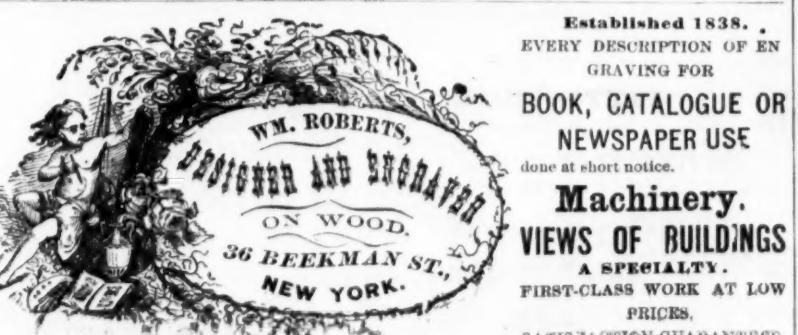
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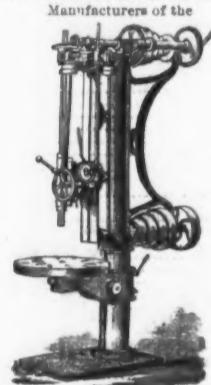
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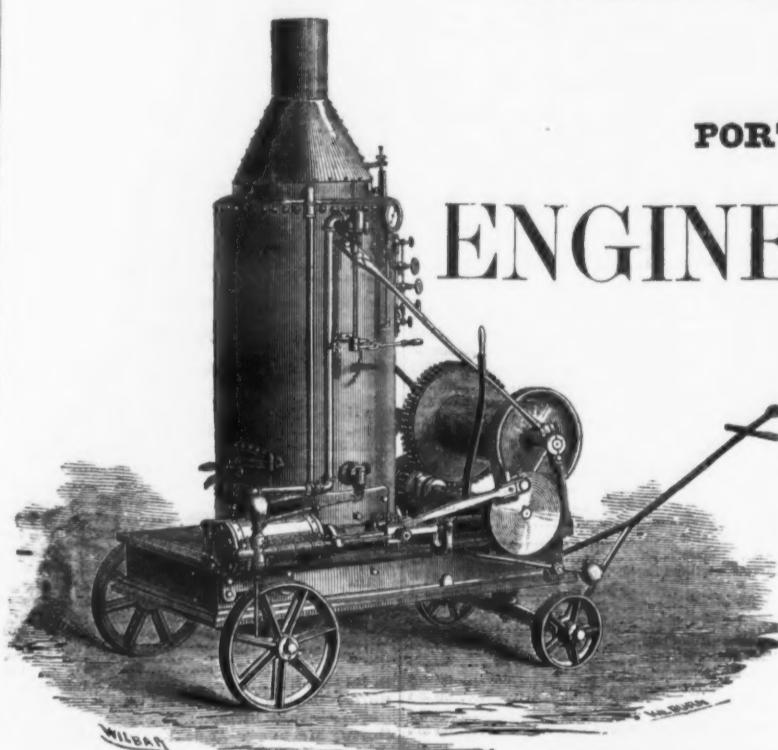
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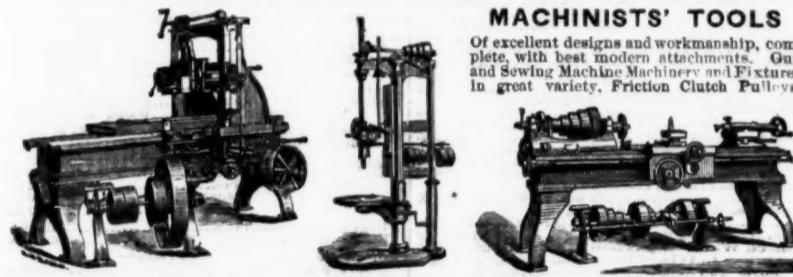
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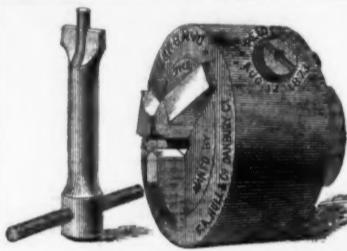
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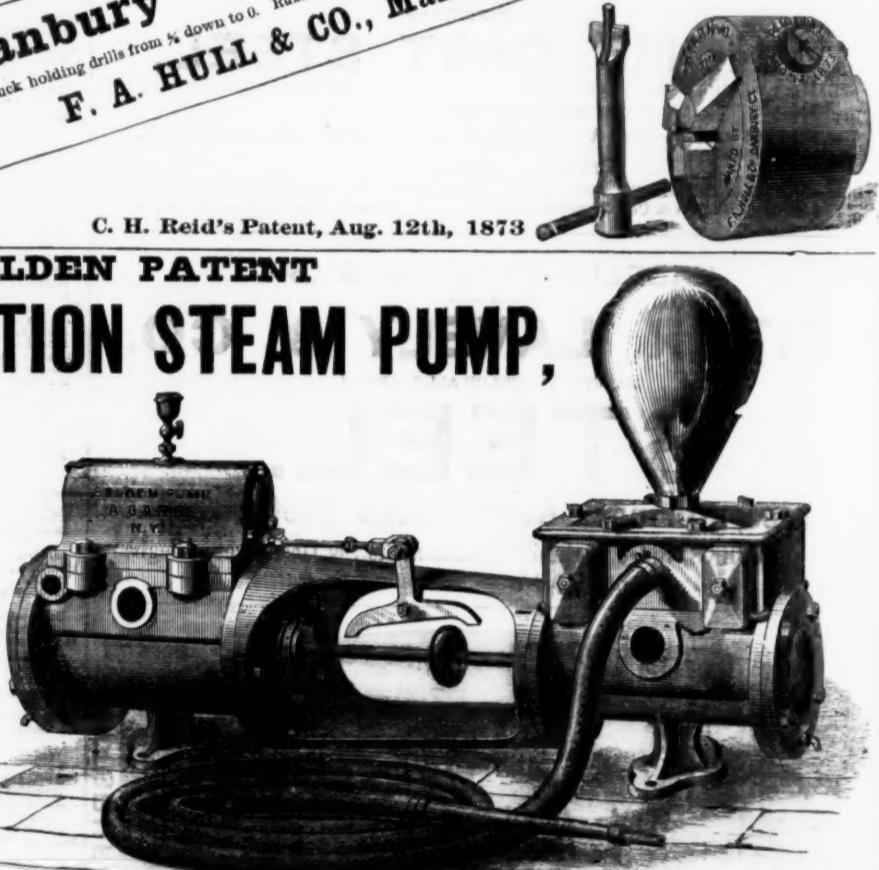
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"Perin" French Band Saw Blade
KEPT IN STOCK.

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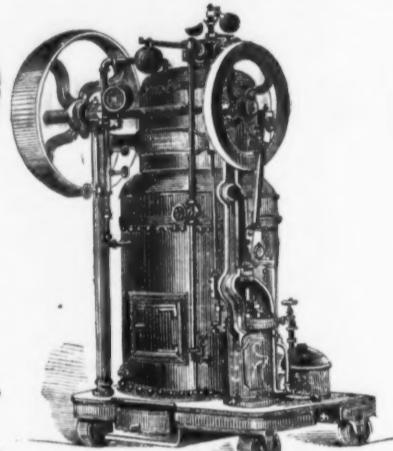
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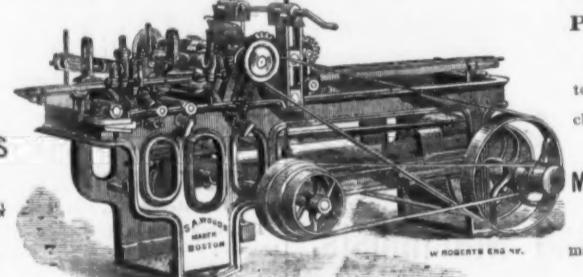
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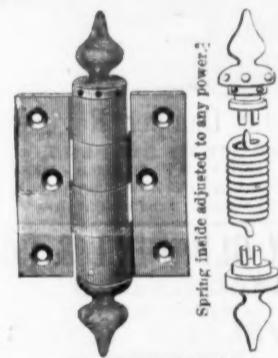
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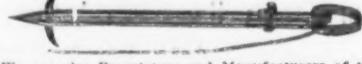
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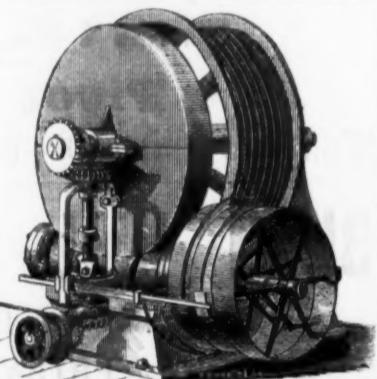
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